EXECUTIVE SUMMARY

Proposed Alaska-Canada Rail Link:

A Review of Potential Benefits

Prepared for:

Yukon Economic Development
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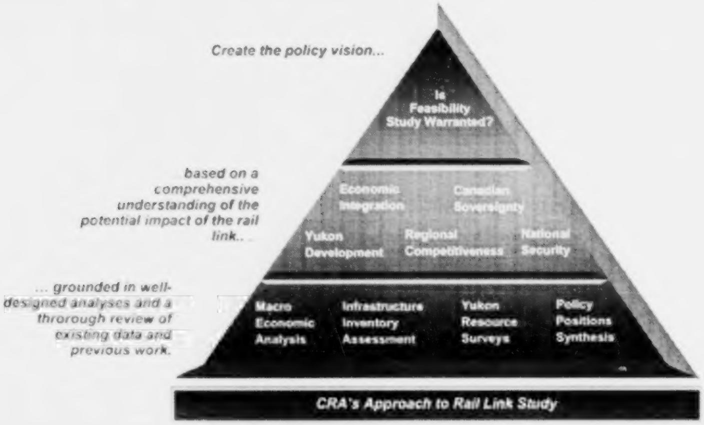
THE POTENTIAL BENEFITS OF THE PROPOSED ALASKA-CANADA RAIL LINK WARRANT PURSUING A DETAILED FEASIBILITY STUDY.

People have been discussing the potential benefits of connecting the Alaska Railroad to the balance of the North American rail system since before the Alaska Railroad was completed in 1923. The Alaska Railroad is a point-to-point railroad connecting the Alaskan interior with the state's major cities and seaports. It is a stand-alone operation and is not connected to any other rail lines in North America. Consequently, rail shipments between Alaska and the rest of Canada, the lower 48 States, and Mexico, must be trans-loaded to or from ocean-going vessels or trucked thousands of kilometers over land.

In 2002, the United States government authorized the expenditure of six million dollars to undertake a detailed feasibility study regarding the proposed rail link connecting the existing Alaska Railroad to the rest of the North American rail system.[1] The United States recognizes that Canada will also benefit from this new transport corridor. Consequently, the U.S. authorization of funds is contingent on the Canadian government also authorizing funds to support the same study. This requirement for joint funding is not surprising in that the eventual success of the project will require close cooperation between public and private sectors on both sides of the border.

Charles River Associates recently completed a review of potential benefits of constructing and operating the Alaska-Canada rail link. The study identified and discussed a number of sources of potential traffic volumes. CRA also reviewed a series of public benefits that might accrue from such a project. The paper concluded that there was a preponderance of evidence supporting the funding of a comprehensive, detailed feasibility study.

Exhibit 1. CRA's analytical framework for the Alaska-Canada Rail Link study


Create the policy vision...
Is Feasibility Study Warranted?
based on a comprehensive understanding of the potential impact of the rail link...
Economic Integration
Canadian Sovereignty
Yukon Development
Regional Competitiveness
National Security
... grounded in well-designed analyses and a throrough review of existing data and previous work.
Macro Economic Analysis
Infrastructure Inventory Assessment
Yukon Resource Surveys
Policy Positions Synthesis
CRA's Approach to Rail Link Study

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[1] 2002 Roads to Resources Bill.

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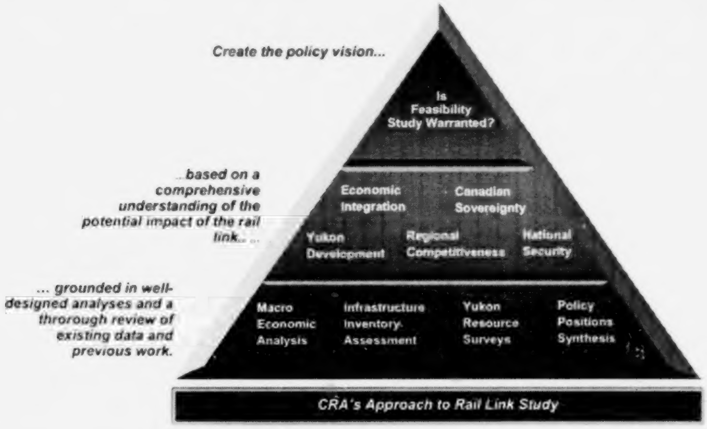
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DEMAND FOR THE ALASKA-CANADA RAIL LINK WOULD BE SUFFICIENTLY STRONG TO JUSTIFY ITS CONSTRUCTION.

Preliminary estimates suggest that the Alaska-Canada Rail Link would enjoy a diverse traffic mix made up of a variety of commodities being shipped between a number of different origin-destination pairs. This portfolio of traffic would support an operation of between six and thirteen mainline trains per day. The projected traffic is largely long-haul, bulk commodity, unit train business and intermodal, the core businesses of every major North American railroad. While further detailed analyses are warranted, it does appear that a sufficient volume of profitable traffic could generate enough profits to justify building the Alaska-Canada Rail Link.

Exhibit 2. Summary of freight flows on the Alaska-Canada Rail Link

	Carloads per Year[1]		Trains per Day[2]	
Freight Flow	**Low**	**High**	**Low**	**High**
Diversion of existing highway and coastal maritime intermodal	24,607	41,476	1	1
Minerals and Semi-Processed Metals	138,133	276,267	4	9
Coal	37,850	75,700	1	2
Other (Mining Materials and Supplies, Defence, Pipeline Construction, Mine Development)	825	1,808	0	1
Total	**201,415**	**395,251**	**6**	**13**

[1] "Carloads per Year " for pipeline construction flows assumes constant demand over five year life; Minerals and Semi-Processed Metals estimated flows assume constant demand from Crest iron ore over 150 year life and from other mines over 50 year life; Coal estimated flows assume constant demand over 50 year life.

[2] "Trains per Day" assumes 100 carload trains operating six days per week.

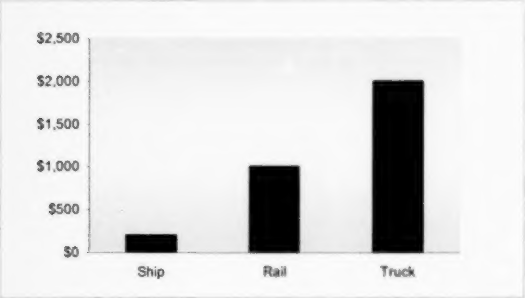
This first approximation of freight volumes indicates that the line would be comparable to a typical medium density North American rail corridor. These projected volumes represent a long-term, steady-state level of flows. Additional analyses are required to detail each specific flow, predict the timing of that flow, and bound the assumptions and probabilities associated with each. As the project unfolds, various development efforts in mining, energy, pipelines, and defence will be developed at different rates. It is likely that existing freight flows between Alaska and the lower 48 will immediately divert to the new, all-rail route, assuming significant cost savings can be achieved. It is likely that new pipeline construction will also account for much of the initial traffic on the new rail link with volumes decreasing as the pipelines near completion. Mine development and outbound mineral resources will have relatively longer lead times and will be dependant on global prices, the chosen route alternative, and the availability of supporting energy sources and supporting local economies.

THE ALASKA-CANADA RAIL LINK WILL EQUIP CANADA TO COMPETE IN THE NEW GLOBAL ECONOMY.

The proposed Alaska-Canada Rail Link will increase access and mobility. Creating a corridor linking Alaska and northern Canada to the world's largest and most efficient freight rail network will facilitate mobility between the United States and Canada and strengthen Yukon and Alaska's connections with the rest of the world. Increased freight access will place the region's vast natural resources in closer reach of the fastest growing global markets. With the creation of the rail link, the Yukon and Alaska will become more involved in a global economy characterized by the following broad trends: reduction in trade barriers, privatisation and liberalisation, Asian economic growth, and security and interdependence.

The proposed rail link will enhance the region's participation in global commerce. International shipping is growing rapidly. Consumers now enjoy a global variety of goods and products, and expect to obtain these at low costs. The costs of high-volume transportation between any two ports in the world are very low. For manufactured goods, transportation costs are approximately $0.01 per tonne-kilometre. For comparison, a 1000-kilometre movement of a container costs about ten times this by truck and about five times this on the best rail intermodal service.

Exhibit 3. Approximate cost of a 1,000-kilometre container move



Source: CRA estimates.

Consider what it means to the consumer for companies to be able to ship a container halfway around the world for, say, $3,600. A container can hold about 20 tonnes of merchandise, so the cost per tonne would be on the order of $180 and the cost per kilogram would be less than $0.18. Compare these two figures to the cost of, say, a $48 book marketed in North America by a European publisher or a $240 electronic device manufactured in Japan. The value of other manufactured goods can be higher, about $24,000/tonne for automobiles, much more for computers and consumer electronics. Shipping products like these internationally adds less than one percent to their cost.

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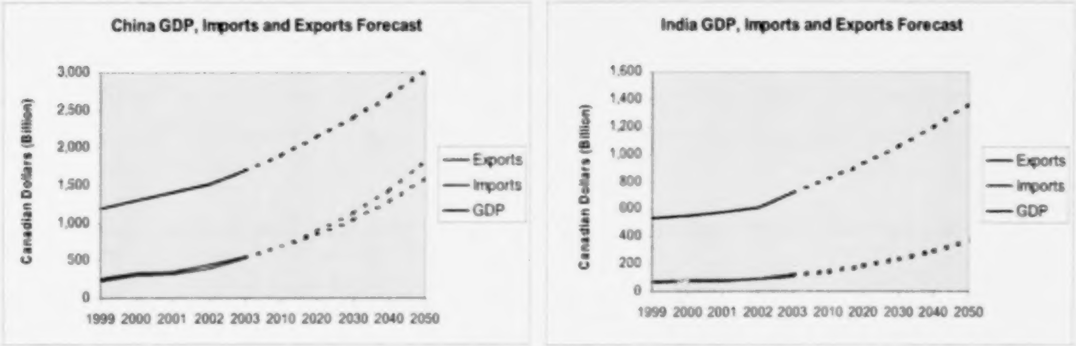
[2] World Bank, 2004 World Development Indicators.

POPULATION AND INCOME GROWTH ARE INCREASING THE DEMAND FOR RAW MATERIALS.

The combined effects of booming world population and rising consumption per capita increases are creating unparalleled demand for scarce natural resources. Shrinking resource supplies cause increased commodity prices. The U.S. Census Bureau projects the world population will grow by about 46 percent from 2004 to 2050.[3] With this growth, the prices of mineral commodities can be expected to increase substantially. Mineral properties that were once overlooked due to cost impediments will likely become sought after locations. As demand increases, deposits once considered too costly to develop are quickly becoming economically viable.

Exhibit 4. China and India are poised for exponential economic growth.



Source: *World Development Indicators (WDI)* database, Aug. 2004.

Notes: 1. GDP forecast of China based on growth rate of 4.7 percent, as used in a Goldman senior economist's model (Forecast sees China topping global economy by 2050, Daily Times, Dec. 13th, 2004).

2. Export and import forecasts for China based on growth rates of 11 percent and 13 percent, respectively.

3. GDP, export, and import forecasts for India are based on growth rates of 6.6 percent, 13 percent, and 12 percent, respectively.

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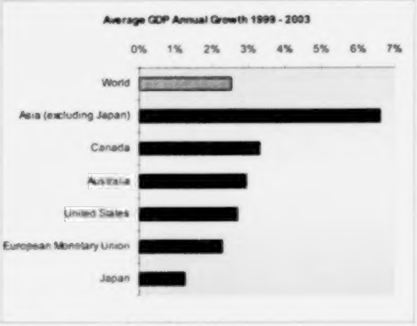
[3] U.S. Bureau of the Census, International Data Base. Total Midyear Population for the World: 1950-2050.

WORLD ECONOMIC GROWTH IS BEING FUELLED BY ASIA.

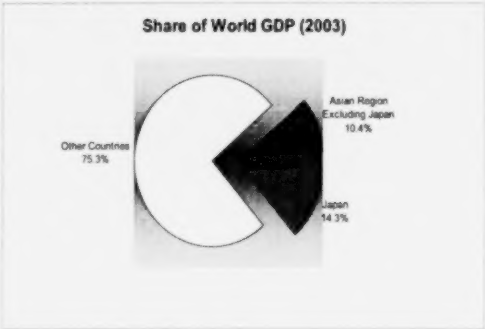
Since 2002, the world economy has been steadily recovering from a global recession. The economic growth rate in 2004 was 5.0 percent; in 2005, world GDP is expected to grow at 4.3 percent. The growth rates of emerging markets and developing countries are much higher than those of advanced economies. Similarly, the import/export volume is higher in emerging markets and developing countries. For example, while the world GDP growth rate was 2.7 percent from 1990 to 2002, the GDP growth rates for East Asia and Pacific and South Asia were 7.3 percent and 5.4 percent, respectively. China and India's economies grew at 9.7 percent and 5.8 percent, respectively, for that same time period.[4]

Exhibit 5. Asia is the growth engine of the world economy.



Source: *World Development Indicators (WDI)* database, Aug. 2004.

Exhibit 6. Asia comprises a quarter of the world economy.



Source: Japanese Statistical Bureau and Asian Development Bank

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[4] World Bank, 2004 World Development Indicators.

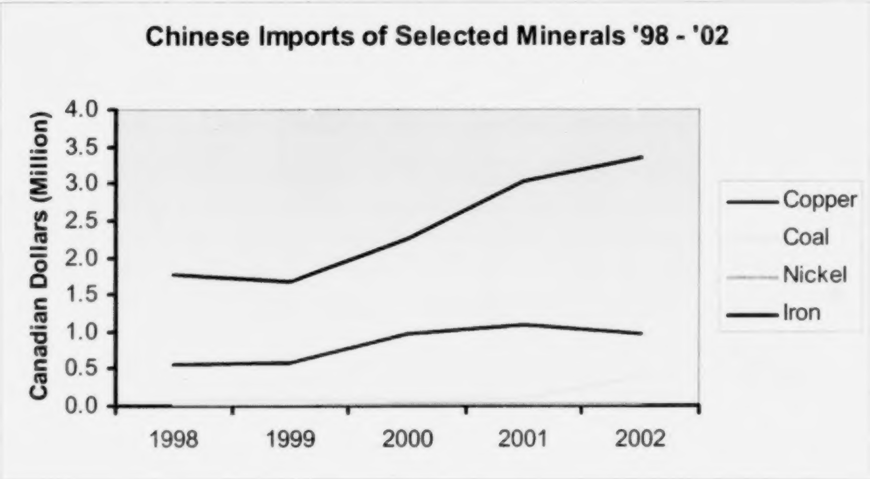
YUKON AND ALASKA CAN INCREASE EXPORTS TO THE GLOBAL MARKET.

Globally there is a documented growing demand for commodities, creating opportunities for the Yukon and Alaska's commodity industries. The geographical proximity of Yukon and Alaska to fast growing demand centers in Asia must also be considered when drawing implications for Yukon and Alaska trade development.

Rapid growth of the world's manufacturing industry is creating a robust market for the region's unearthed commodities. Alaska and the Yukon's most potentially significant commodities are iron ore, platinum, palladium, tungsten, barite, zinc, lead, gold, coal, copper, nickel, and molybdenum. The consumption of all of these minerals rose substantially in a ten-year analysis (1991-2000 for most minerals)—most with large double-digit ten-year growth rates.[5]

Of the Yukon commodities, China could potentially be a large buyer of iron ore, copper, platinum, and gold. In 2002, China spent $3.3 billion, $1 billion, and $400 million Canadian dollars on iron ore, copper, and coal, respectively. Petroleum was the only commodity on which China spent more money. As China's economy and manufacturing sector grow, the demand for these inputs will increase substantially—an opportunity from which the Yukon can profit.

Exhibit 7. Chinese import demand has risen for future Yukon mineral exports.



Source: *International Trade Statistics,* International Trade Center

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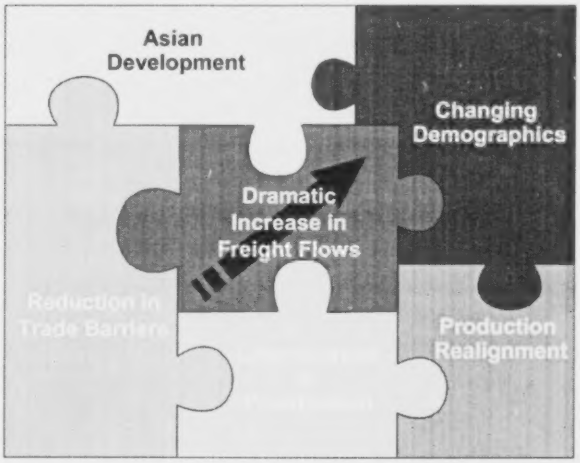
[5] Data on minerals production was collected from *Metal Statistics 2001.* Pinkham, Myra (ed.) The Bennett Group. International Energy Annual 2002, Energy Information Administration. See Full Report, "Proposed Alaska-Canada Rail Link: A Review of Potential Benefits" for more detail on this matter.

TRANSPORTATION CAPACITY IS LIMITED AND CONGESTION IS GROWING.

The predominant modes of freight transportation are railways, highways, waterways, and pipelines, each of which is experiencing trends that contribute to capacity shortages. This situation presents an opportunity for Canada to develop alternative transportation capacity that will serve all of North America and help address the impending crisis in the United States.

As congestion worsens and the demand for the limited supply of transportation capacity increases, the cost of shipping natural resources from regions that are experiencing congestion will increase. Not only will the unit costs of shipping increase, the cost of doing business in those regions will increase. Congestion slows the flow of goods, creating more in-process inventory and higher carrying costs to businesses. Congestion erodes consistency and reliability in the transport system, causing businesses to have to increase safety stock or experience stock-outs more often.

Exhibit 8. Multiple factors have combined to increase the global freight flows.


Asian Development
Changing Demographics
Dramatic Increase in Freight Flows
Reduction in Trade Barriers
Production Realignment

As the cost of sourcing raw materials from other parts of the world increases, the relative attractiveness of developing access to the Yukon region also increases. The Yukon is especially well positioned to take advantage of other regions' congestion problems given the nature of the commodities that would likely use the Alaska-Canada Rail Link. Transportation costs are a much smaller component of total costs for high valued, manufactured goods than bulk minerals. Consequently, in congested regions, producers and consumers of expensive goods will be more willing to absorb the increase costs of congestion and squeeze out the shippers of relatively low valued bulk commodities.

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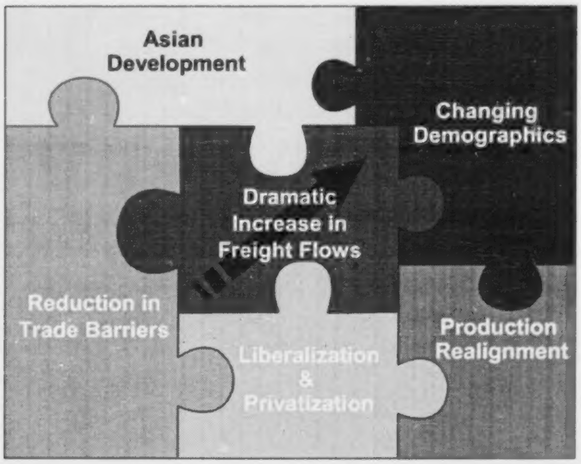
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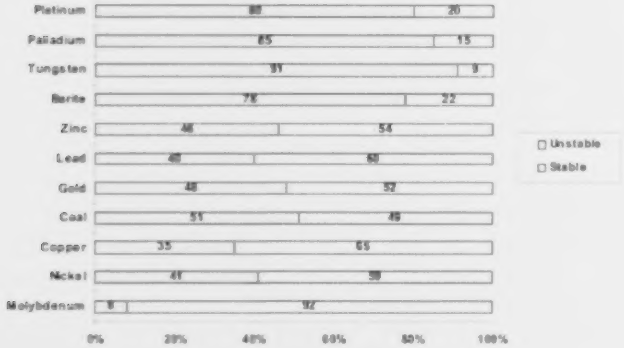
ECONOMIC INTERDEPENDENCE UNDERSCORES THE VALUE OF YUKON STABILITY.

Globalization has brought a never-before-known level of interdependence to the world. As countries become more dependent upon one another economically, national economies are more at risk to disruptive events and crises around the world. Periodic disruptions in supply chains can cripple a manufacturing plant and create ripples throughout an entire economy. For example, many chemical processing plants require a constant supply of raw materials to feed a continuous manufacturing process. In the absence of even one input, the plant must shut down. Large fluctuations in supply and demand, devaluations in currencies, and other macroeconomic crises in one part of the world can register almost instantly across the globe. The impact can range from a dampening of the stock market to the eradication of an economic base.

Secure trade routes help ensure stable financial markets. The potential value and importance of the Yukon as an international exporter of minerals and other natural resources is reinforced by its position of security and stability vis-à-vis many of its would-be competitors. As a result of these kinds of geopolitical risks, companies often hesitate to invest in unstable countries and are most interested in securing natural resources from stable markets.

As investors place a premium on secure trading partners, Yukon and Alaskan commodities will look like especially good bets. Many of the commodities that the Yukon can potentially export are in high demand and are currently supplied in large part by less stable countries. The significant Yukon/Alaskan minerals (platinum, palladium, tungsten, barite, zinc, lead, gold, coal, copper, nickel, molybdenum) are produced largely in 28 major countries. 18 of those countries, including Russia, North Korea, Kazakhstan, China, and Zimbabwe, can be classified as potentially unstable and/or in danger of economic collapse.

Exhibit 9. A large portion of the global minerals supply comes from risky sources.



Sources: *Metal Statistics 2001*, Pinkham, Myra (Ed), The Bennett Group; *Index Mundi*, *International Energy Annual 2002*, Energy Information Administration.

Note: CRA stability estimates based on bond ratings, and country risk premiums, and Transparency International's Corruption Perceptions Index (CPI).

THE RAIL LINK WOULD CATALYZE THE YUKON'S IMMENSE MINERAL DEVELOPMENT POTENTIAL.

For more than a decade, the Yukon has been experiencing a significant decline in mineral production. In 1990, mining revenue exceeded $500 million; by 2004 mining revenue had dropped by 94 percent to $30 million. In spite of this, however, there has been a flurry of development and exploration activity in recent years that may be the catalyst for potential development in the near future. For example, mining companies, including Yukon Zinc Corporation, have applied for licenses and are currently pursuing opportunities to develop properties in the Finlayson District in southeastern Yukon, an area of fairly intensive activity over the last few years both for smaller Canadian companies and major world mineral companies.

Exhibit 10. Many of the most valuable Yukon mineral reserves remain untouched.

		In Development		Prospect	
	Mineral Name	No. of Deposits	Total Resources (Million CD)	No. of Deposits	Total Resources (Million CD)
1	Gold	2	471	1	716
2	Zinc/Lead/Silver	1	1,062	9	4,324
3	Coal	–	–	3	16,057
4	Copper/Gold*	2	462	5	3,728
5	Molybdenum	–	–	1	420
6	Nickel/PGM's	–	–	1	1,470
7	Iron Ore	–	–	1	39,530
8	Tungsten	–	–	2	185

Source: George Rainville, Associate Principal, CRA.

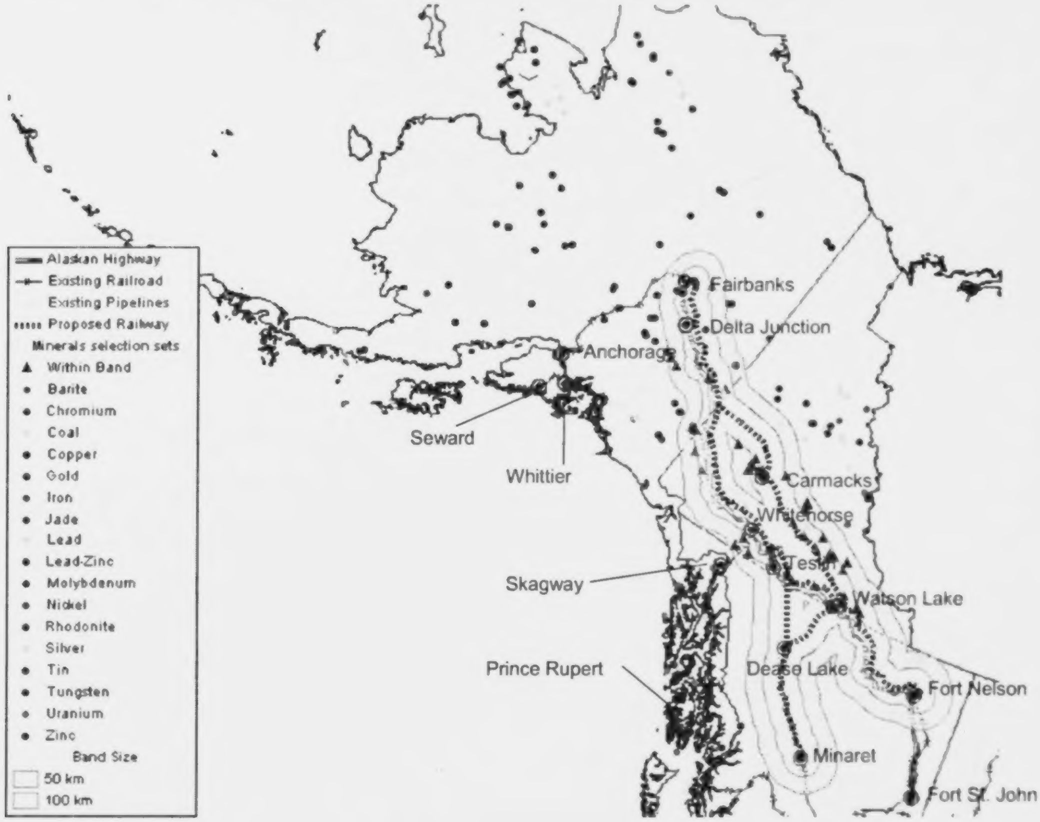
It is always difficult to evaluate underdeveloped resources; however, the process is made somewhat easier in the Yukon because of its history of mining and extensive mineral potential. CRA has reviewed more than 80 deposit areas representative of the likely known significant projects that could come into existence over the next several decades. We concluded that 34 of these deposits should be considered as having significant potential for future development.

We estimated the total mineral resource value in the Yukon to be $57 billion. This estimate was calculated utilizing the total value of reserves and resources likely to be recovered from the 34 deposits over the project's life. Certainly this value could be enhanced by expansion of reserves bases at the 34 deposit areas that are currently valued, by development of other known resources, by further downstream processing of concentrates, or by new mineral discoveries that occur with improved infrastructure.

THE YUKON HAS MINERAL PRODUCTION POTENTIAL OF $2.5 BILLION PER YEAR.

CRA assigned an operational life to the reserve and resource base for each of the deposits corresponding to its size and likely level of exploitation. The annual value of a deposit is based on yearly production of metal value in concentrate for base metals as determined by likely buy schedules and by the free on board, or already loaded, value of mineral products. On this basis, over $ 2.5 billion per year could be produced in the Yukon if all 34 prospects were operating—although these projects will be phased in at different times.

Exhibit 11. The proposed railway would access multiple mineral deposits.

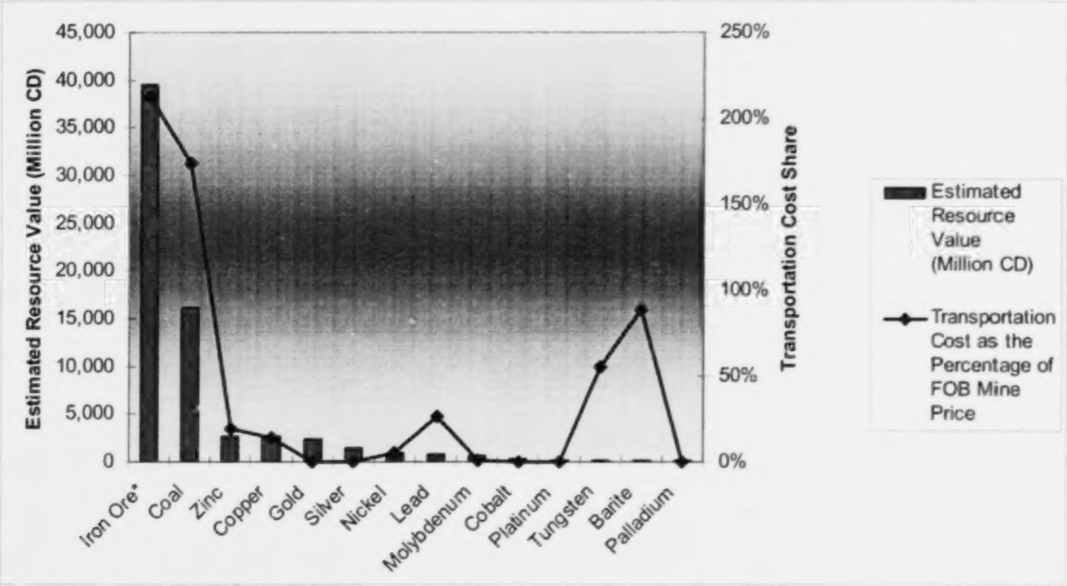

Alaskan Highway
Existing Railroad
Existing Pipelines
Proposed Railway
Minerals selection sets
Within Band
Barite
Chromium
Coal
Copper
Gold
Iron
Jade
Lead
Lead-Zinc
Molybdenum
Nickel
Rhodonite
Silver
Tin
Tungsten
Uranium
Zinc
Band Size
50 km
100 km
Fairbanks
Delta Junction
Anchorage
Seward
Whittier
Carmacks
Whitehorse
Teslin
Skagway
Watson Lake
Prince Rupert
Dease Lake
Fort Nelson
Minaret
Fort St. John

Sources: 1. Report on Survey Trans-Canadian Alaska Railway Location, 1942 U.S. Army Corps of Engineers.
2. The Alaska – Canada Railroad Corridor Feasibility Study, Canadian Arctic Railway Company.
3. Overview, 2003. Yukon Geological Survey. Yukon Mining, Development and Exploration.
4. Alaska Mineral Locations Database, Interagency Minerals Coordinating Group.

TRANSPORTATION IS CRUCIAL TO MINERAL EXPLORATION, DEVELOPMENT, AND PRODUCTION.

Needless to say, mining is a transportation intensive business, especially in areas as geographically remote as many of the Yukon's mineral deposits. Large amounts of equipment and materials need to be transported to a site just to begin operations. The on-going mining process requires additional inbound materials and supplies. Mined minerals need to be moved from the mine to processing plants, and from there to the ultimate consumers of the products. Transportation is of even greater concern for the Yukon due to the immense distances between potential mineral resource developments and shipping access routes. The proposed Alaska-Canada Rail Link will facilitate natural resource development by lowering the cost of transportation in several key arenas.

Exhibit 12. Yukon's most valuable mineral resources are costly to transport.



*Concentrate

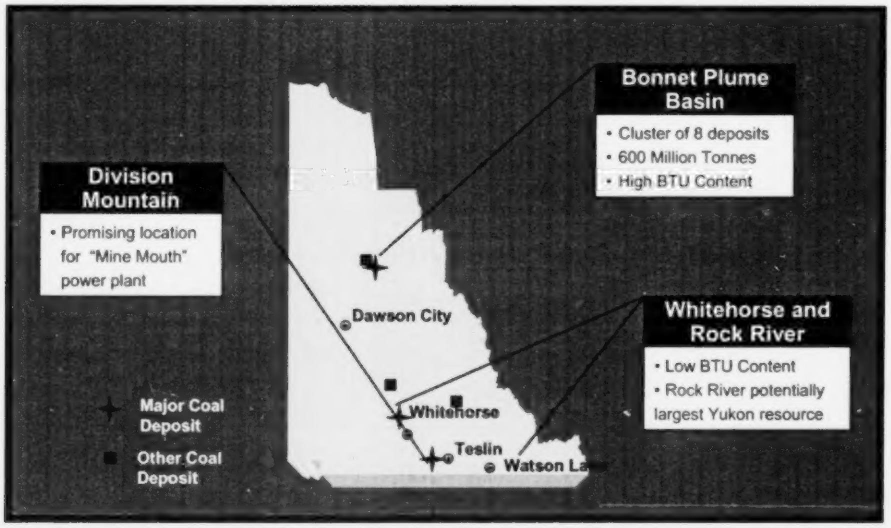
THE NEW RAILROAD WILL FACILITATE THE DEVELOPMENT OF NEW ENERGY PRODUCTION AND TRANSMISSION CAPACITY.

The Yukon depends on imported fossil fuels for three quarters of its energy needs. Yukon residents and officials are conscious of the outflow of Canadian dollars required to purchase and transport energy. Yukon residents pay on average 41.8 percent more for energy while consuming 19.2 percent less energy than those living elsewhere in Canada.[6]

LACK OF RAIL INFRASTRUCTURE HAS LIMITED YUKON COAL MINING.

Oil, natural gas, and hydroelectric generation are currently Yukon's most important sources of energy. However, coal may be a large component of future energy growth in the Yukon as is already the case in Alaska, which produces 1.5 million tonnes of coal per year from the Usibelli mine alone. Alaska exports half of its coal to Asia and consumes the balance in four power facilities. The Yukon has 800 million tonnes of identified coal deposits. The most valuable of these are the Bonnet Plume Basin (660 million tonnes), Rock River (60 million tonnes), Whitehorse (26 million tonnes), and Division Mountain (45 million tonnes). Bonnet Plume Basin's low sulphur content, thick seam, and power factor of 9,700 BTU/lb make this mine the most attractive coal prospect in the Yukon. The Division Mountain, with its close proximity to the Alaskan highway, may be an ideal site for a "mine-mouth" coal plant with production potential of 200 megawatts per day.

Exhibit 13. The Yukon has promising coal resources.


Bonnet Plume Basin
• Cluster of 8 deposits
• 600 Million Tonnes
• High BTU Content
Division Mountain
• Promising location for "Mine Mouth" power plant
Dawson City
Whitehorse and Rock River
• Low BTU Content
• Rock River potentially largest Yukon resource
Major Coal Deposit
Other Coal Deposit
Whitehorse
Teslin
Watson La

Source: *Yukon Mineral Deposits*, Jan. 2004, Yukon Geological Survey.

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[6] Based on 1999 data, Statistics Canada catalogue no 57-202.

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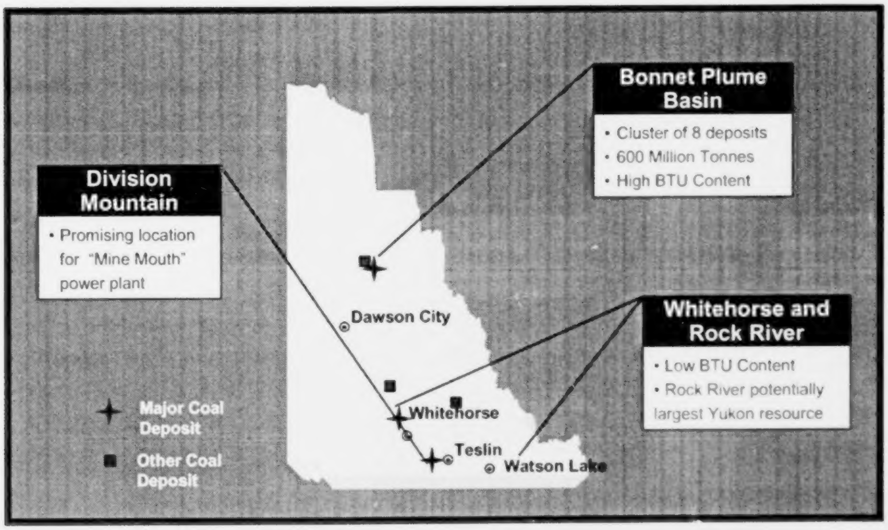
Bonnet Plume Basin
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Other Coal Deposit

Source: *Yukon Mineral Deposits*, Jan. 2004, Yukon Geological Survey.

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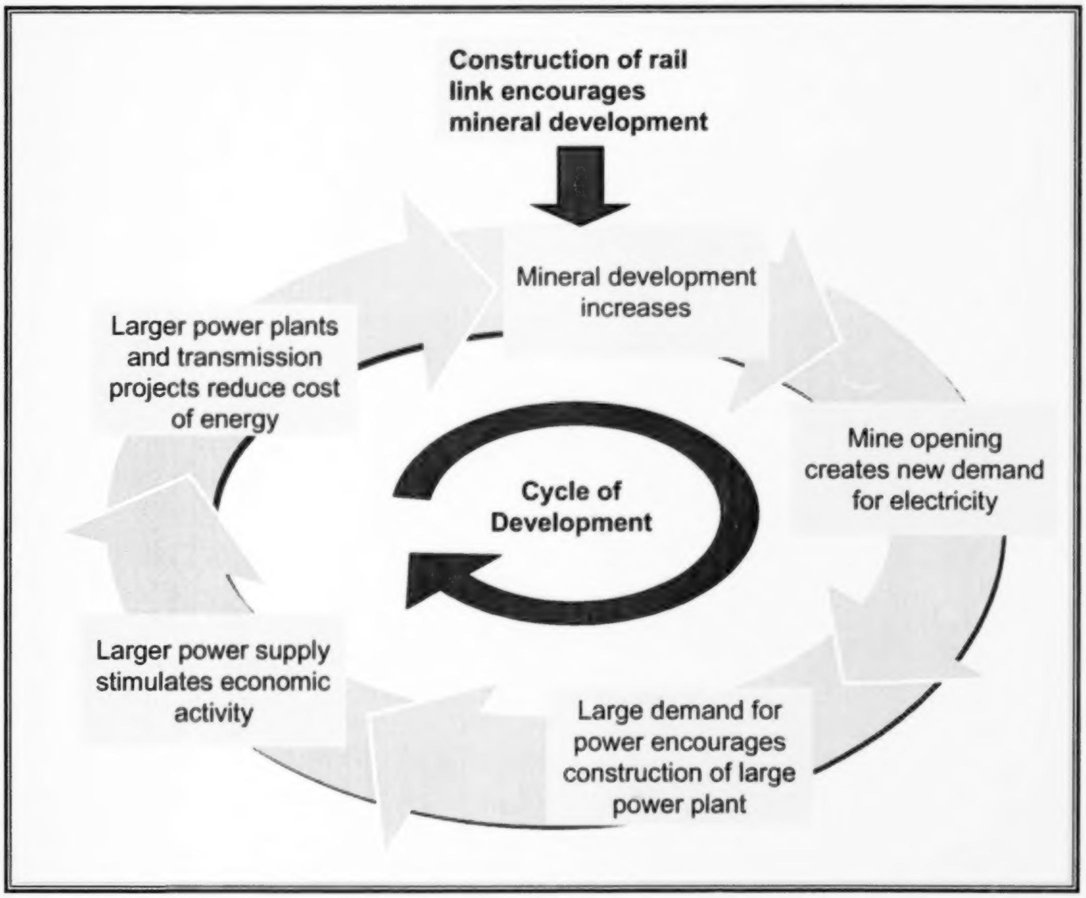
[6] Based on 1999 data, Statistics Canada catalogue no 57-202.

THE PROPOSED RAILROAD, MINES, AND ENERGY INFRASTRUCTURES COULD BE DEVELOPED SIMULTANEOUSLY.

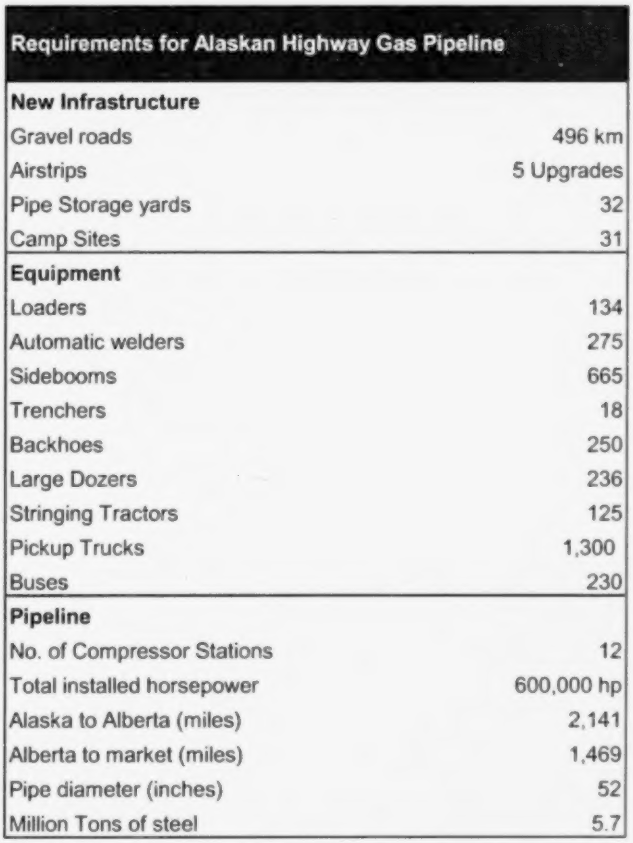
Developing mines to access the Yukon's rich resources will require power to crush and grind ore. Underground mines will consume energy in hoisting and ventilation. Mining operations require two to thirty megawatts per year depending on size, depth, extraction method, and ore density. Inefficient and relatively costly diesel generators typically power remote mining operations, as other sources of energy are unavailable. The Yukon's current transmission system can only support limited mineral development. Large mining operations in the Tintina Trench region will likely require the upgrading of both the 69 KV transmission line from Mayo to Dawson as well as the Whitehorse grid system. Once completed, the railroad will encourage development of new mines putting a strain on existing power infrastructure and encouraging new investment.

Exhibit 14. Construction of the rail link will catalyze mineral and energy development.


Construction of rail link encourages mineral development
Mineral development increases
Mine opening creates new demand for electricity
Large demand for power encourages construction of large power plant
Larger power supply stimulates economic activity
Larger power plants and transmission projects reduce cost of energy
Cycle of Development

Economic benefits will result from coordinating the development of new infrastructure through the Yukon, including mines, pipelines, highways, railways, electricity grids, and supporting infrastructure. Power production and transmission in sparsely populated regions typically develops in a slow gradual process. The rail link will likely expedite grid evolution by boosting both energy supply and demand. The rail right of way will be a natural corridor for potential shared use by both pipelines and electrical transmission lines. Improved infrastructure will encourage development of the Yukon's petroleum and coal energy resources. Construction of the rail link will draw workers and machinery into the Yukon creating economies of scale and a stable source of inputs required for a wide variety of construction and development projects. For example, the railroad will facilitate the movement of the vast amounts of machinery and materials required to construct the proposed North Slope to Chicago pipeline.

Exhibit 15. Heavy infrastructure and equipment would be required to build the North Slope to Chicago pipeline.



Requirements for Alaskan Highway Gas Pipeline	
New Infrastructure	
Gravel roads	496 km
Airstrips	5 Upgrades
Pipe Storage yards	32
Camp Sites	31
Equipment	
Loaders	134
Automatic welders	275
Sidebooms	665
Trenchers	18
Backhoes	250
Large Dozers	236
Stringing Tractors	125
Pickup Trucks	1,300
Buses	230
Pipeline	
No. of Compressor Stations	12
Total installed horsepower	600,000 hp
Alaska to Alberta (miles)	2,141
Alberta to market (miles)	1,469
Pipe diameter (inches)	52
Million Tons of steel	5.7

Source: CRA calculations

THE ALASKA-CANADA RAIL LINK WILL GENERATE OTHER ECONOMIC AND NON-ECONOMIC BENEFITS AND SUPPORT PUBLIC POLICY OBJECTIVES.

Regional Economic Development, Economic Integration, and Sovereignty

Developing the corridor has the potential to bring enhanced economic activity, employment growth, and population growth to regions in the Yukon, Alaska, and northern British Columbia. However, private markets place no inherent value on economic development taking place in one region rather than another. From the perspective of the citizens of these regions and the citizens of Canada and the United States, developing these regions may produce substantial benefits not captured in market prices and returns. Among these benefits are the value resulting from better integration of the Yukon's economy with the rest of Canada's, the potential of bringing economic benefits and greater economic integration to First Nations' communities, and the value for Canada of spurring economic development in northern Canada as a means of increasing the region's population and strengthening the nation's claim to sovereignty of its Arctic regions. For Alaska and the United States as well, there may be benefits to further integrating Alaska's economy with those of Canada and the lower 48 States.

From a local and regional perspective, corridor development will produce direct economic benefits for affected communities in the form of new economic activity and associated employment in construction, maintenance, and operation of the railroad and other corridor infrastructure. From the perspective of the national economies of Canada and the United States, some of these regional economic benefits may be offset by costs elsewhere in their economies.

Assessing and documenting the development effects of corridor development at local, regional, and national levels will not occur without government involvement. It is clearly the role of the relevant governments to make decisions about what weight to place on the various economic and non-economic benefits and costs that corridor development may bring.

Defence and National Security

U.S. forces in Alaska play an important part in safeguarding international security. Alaska is home to a wide range of U.S. air, ground, coast guard, and missile defence forces. However, the lack of a suitable land link to the more populous areas of North America constrains the speed with which forces—particularly ground forces—based in Alaska can react to international crises and cooperate with forces further south. In this context, the proposed rail link would bring three important military benefits.

First, the Alaska-Canada Rail Link would enable better opportunities for joint training at CF Bases in the west. Second, the proposed rail link would bring better mobility for U.S. Army troops stationed in Alaska. Third, linking Alaska to the lower 48 will also enhance security in Northeast Asia. By opening another transport link to Alaska, the proposed railroad would enhance its role in ensuring the security of northeast Asia and North America.

In times of emergency, a country's national security can hinge on its ability to access the equipment, goods, and other materials it needs to respond appropriately. To facilitate the efficient transport of supplies, it is important to have multiple access routes both to increase the speed and capacity at which the supplies travel, as well as to serve as a back up route should one route or the other become unavailable. In the case of Alaska and the Yukon, the existing Alaska Highway is insufficient for securely moving goods during times of war and/or disaster. The addition of a second, multiuse corridor, such as the proposed railway, could prove to be of critical importance in ensuring Canada and the United States' national security.

Passenger Tourism Development Opportunities

The proposed Alaska-Canada Rail Link may stimulate growth in the important economic sector of passenger tourism. Worldwide, tourism is one of the major economic sectors, contributing as much as 10.2 percent of the gross global domestic product (GDP), and it is a leading component of international trade.[7] In 2002, the number of international tourists topped 700 million. The tourism industry is an important and growing sector for both Alaska and the Yukon. In Alaska, tourism is the fourth largest employer in Alaska, supplying 25,996 jobs in 2002. Residents and non-residents spent a total of $2.9 billion, of which Alaska retained $1.8 billion.[8]

The region is clearly amenable to rail tourism; the White Pass & Yukon operates solely as a tourist railway, and the Alaska Railroad operates profitable daily passenger service during the summer months. These tourist routes, however, are readily accessible to and extensively utilized by cruise ship passengers, an advantage that a rail link through the interior regions of the Yukon and Alaska would not enjoy. Nonetheless, a Yukon rail link might prove attractive to tour operators seeking to offer specialized scenic and wilderness tourism to currently little-travelled areas.

An analysis of the proposed rail link's effect on tourism must first determine where most ecotourists come from, by which mode of travel they arrive, what attracts them to a destination, and what their motivations and expectations are. It must then explore how the proposed rail link might enhance the tourist experience and draw new visitors.

---

[7] WTO, 2003.

[8] Economic Performance Report 2003, pp. 28-29.

GOVERNMENT HAS AN IMPORTANT COORDINATING ROLE.

From a social perspective, there is clear role for government to play in developing the information that will assist private investors in making decisions about whether and where to invest in developing the Corridor. Preliminary work in assessing the economic feasibility of Corridor development falls into the category of basic research that is appropriately supported by government. The benefits that developing the Corridor may provide to private interests, while potentially substantial, are likely to be widespread, relatively diffuse, and subject to numerous individual uncertainties. For this reason, no single private party is likely to undertake the relatively far-ranging study that will be needed to assess the value of the widespread and diffuse benefits, and to assess all of the potentially relevant costs and uncertainties that could stand in the way of corridor development. Once all potentially interested parties have been presented with the results of such a study, it could serve as a spur for them to undertake further studies and investments needed to effectively develop the Corridor to help develop more fully developed business and policy cases for (or against) Corridor development. Absent the support of basic research like that proposed for joint funding by the U.S. and Canadian governments, however, the potentially worthwhile Corridor development could be the subject of unnecessary delays or even be foregone entirely.

Exhibit 16. Government should be involved in large and complex projects.

	Purely Private	Significant Public Involvement	Purely Government
Attributes	Limited or no externalities Minimal coordination / transaction cost problems	Significant externalities Significant coordination issues	Extensive externalities Significant coordination / cost issues
Examples	Private Housing Retail Stores	Port Development Environmental Clean-Up Telecommunications (Standard Setting and Spectrum Allocation)	National Defence National Highway System

Governments can often help facilitate private investment by overcoming coordination and information problems that markets cannot easily overcome. A clear example of this is the coordination of right-of-way land acquisition. Government can play a key role in facilitating site selection for the corridor.

EXTERNAL COSTS AND BENEFITS REQUIRE GOVERNMENT INVOLVEMENT.

External costs, also referred to as "externalities," become economic costs when the actions of individuals, firms, or governments create spillover costs for other parties, the value of which is not priced in the marketplace. In the case of the Alaska-Canada Rail Link, there are numerous potential external costs and benefits that may not be properly priced by private markets and that will need to be taken into account as decisions are made as to whether, how, and when to develop the corridor. These include environmental impacts; the effect of the corridor on regional economic development, economic integration, and Canadian sovereignty; and the benefits the corridor may create for Canada and the United States' safety and security.

Environmental Costs and Benefits

Government clearly has a role in protecting the environment and ensuring appropriate measures are taken to minimize the environmental impacts of development. Building the Canada-Alaska Rail Link will likely entail a wide range of potential costs and benefits to the natural environment. On the cost side, corridor development could encroach on environmentally sensitive areas, requiring government involvement in route selection and in the creation of appropriate laws and oversight mechanisms. This would ensure that the railroad and other transportation entities sharing the corridor would be given the appropriate incentives to operate in an environmentally sensitive manner.

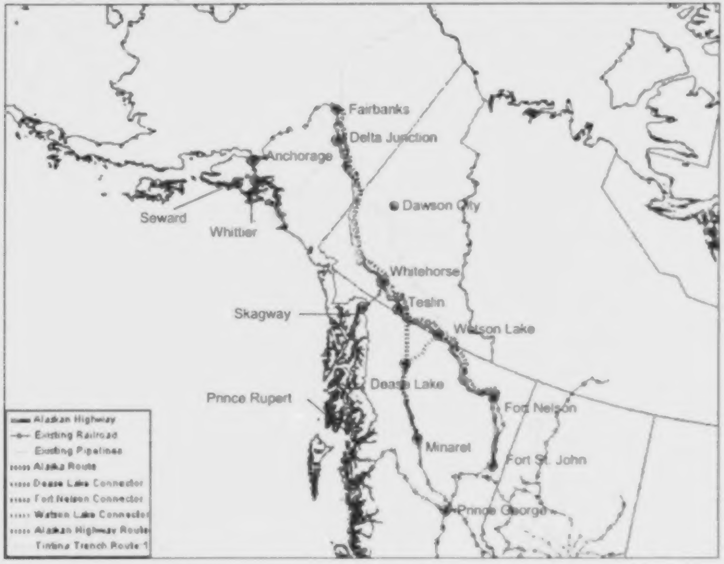
The creation of the corridor could also lead to substantial environmental benefits. It would be beneficial if the rail corridor were to divert freight that would otherwise be transported via the Alaska Highway since rail is a less energy-intensive mode of transport, and generally more environmentally friendly than road transportation.

ALTERNATIVE ROUTES THROUGH THE YUKON MUST BE EVALUATED.

The literature to date has identified two alternative routes for the Alaska-Canada Rail Link. The first suggested route parallels the Alaska Highway and would benefit north-south flows of traffic from Alaska and the Yukon to the Pacific Northwest region of the United States.

The second route, originally proposed the U.S. Army Corps of Engineers in 1942, takes a more northerly course down the Tintina Trench. It follows river grades and accesses many mineral deposits.

Exhibit 17. Proposed route alternatives for the Alaska-Canada Rail Link


Fairbanks
Delta Junction
Anchorage
Seward
Whittier
Dawson City
Whitehorse
Teslin
Skagway
Watson Lake
Dease Lake
Prince Rupert
Fort Nelson
Minaret
Fort St. John
Prince George
Alaskan Highway
Existing Railroad
Existing Pipelines
Alaska Route
Dease Lake Connector
Fort Nelson Connector
Watson Lake Connector
Alaskan Highway Route
Tintina Trench Route 1

Sources: *Report on Survey Trans Canadian Alaska Railway Location*, 1942 U.S. Army Corps of Engineers, and *Alaska – Canada Railroad Corridor Feasibility Study*, Canadian Arctic Railway Company, 2004.

Additional route alternatives should be assessed.

Work to date regarding route selection for the proposed Canada-Alaska Rail Link has focused on the ease of construction and access to Alaskan markets. Canada and the Yukon would be well served by considering other route alternatives that also maximize access to Yukon mineral deposits thus motivating resource development. Accessing the Crest iron ore deposit, for example, would significantly increase the positive contribution and the economic viability of this project.

Clearly, a comprehensive route alternatives analysis and selection is warranted. Route selection must trade off length of haul, distance from mines to the trunk line, severity of route, and environmental impacts. Longer routes cost more to build and operate. Routes with many hills, curves, and bridges also cost a lot to build and maintain. Modern survey technology, engineering CAD systems, and GIS analyses can assess the many attributes of each route relatively easily and provide a framework for analyzing these tradeoffs. A feasibility study needs to consider all of the engineering, operation, commercial, economic, social, and environmental implications of each route alternative.

CONCLUSION

Effectively developing the Alaska-Canada Rail Link will require cooperation of both the U.S. and Canadian governments as well as the governments of Alaska, the Yukon, and British Columbia. Government involvement will address two essential functions related to this project's development. First, government will ensure that external costs and benefits not captured in market demands and prices are taken into account in developing the corridor. Second, government will reduce transaction costs that might hinder the private development of the corridor by disseminating information, removing bureaucratic barriers, and coordinating diverse interests.

It is reasonable for the Government to devote financial support to a detailed feasibility study that will shape this project's definition, detail the business case, and facilitate the efforts of the private sector. This study would be a valuable first step towards addressing coordination problems. It would allow interested parties to begin their planning processes based on a common base of well-founded analysis. By sponsoring such a study, governments will encourage private investors to take a hard look at this opportunity. Investors will more readily be able to make informed decisions regarding the true costs and benefits associated with the future development of the Alaska-Canada Rail Link. We believe the U.S. and Canadian governments will be able to jointly design a comprehensive feasibility study to meet those objectives.

FINAL REPORT

Proposed Alaska-Canada Rail Link:
A Review of Potential Benefits

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February 2005

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DEFINITION OF TERMS

Alaska-Canada Rail Link refers to the proposal to connect the existing Alaska Railroad to the rest of the North American rail system.

All monetary values presented in exhibits and text are in *Canadian dollars.* We used *1.2 Canadian dollars per 1.0 U.S. dollars* to convert source data originally presented in U.S. dollars.

The *text boxes* displayed throughout this paper add global context and insight. Unless otherwise noted, the source of the text boxes is the publicly available CRA authored study *Mobility 2001*, prepared for the *World Business Council for Sustainable Development.*

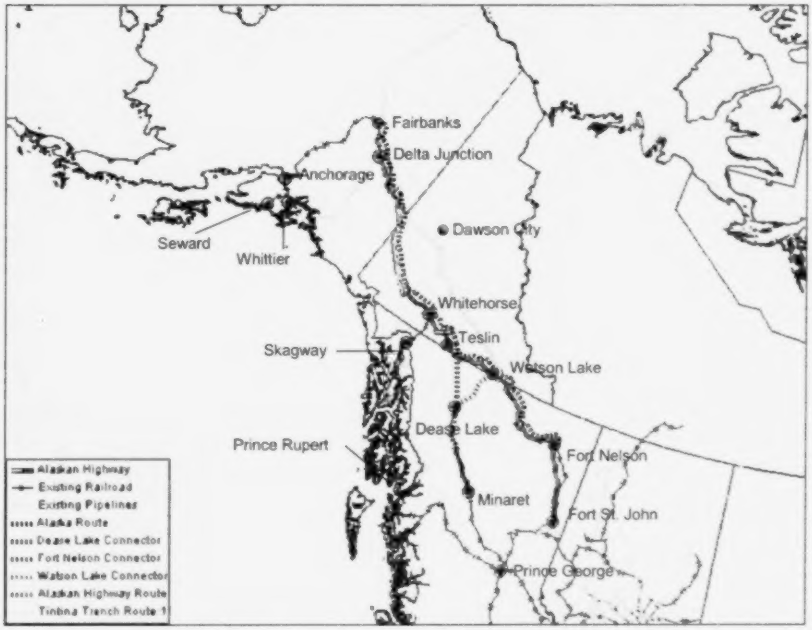
1 Overview

BACKGROUND

People have been discussing the potential benefits of connecting the Alaska Railroad to the balance of the North American rail system since before the Alaska Railroad construction was completed in 1923. The Alaska Railroad is a point-to-point railroad connecting the Alaskan interior with the state's major cities and seaports. The railroad is a stand-alone operation and is not connected to any other rail lines in North America. Consequently, rail shipments between Alaska and the rest of Canada, the lower 48 States, and Mexico, must be trans-loaded to or from ocean-going vessels or trucked thousands of kilometres over land.

The proposed Alaska-Canada Rail Link would connect to the existing Alaska Railroad at its current terminus east of Fairbanks, cross the Yukon Territory, and connect to the Canadian National Railway in British Columbia. Exhibit 1 shows the proposed connection from Fairbanks to optional destinations Dease Lake or Fort Nelson. Interested parties in both Alaska and the Yukon believe that such a link could deliver considerable benefits to the region by lowering transportation costs and by serving as a catalyst for economic development in regions made more accessible.

Exhibit 1. The Proposed Alaska Canada Rail Link will cross the Yukon.


Fairbanks
Delta Junction
Anchorage
Seward
Whittier
Dawson City
Whitehorse
Teslin
Skagway
Watson Lake
Dease Lake
Prince Rupert
Fort Nelson
Minaret
Fort St. John
Prince George
Alaskan Highway
Existing Railroad
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Alaska Route
Dease Lake Connector
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Alaskan Highway Route
Tintina Trench Route 1

Sources: Report on Survey Trans-Canadian Alaska Railway Location, 1942 U.S. Army Corps of Engineers, and Alaska – Canada Railroad Corridor Feasibility Study, Canadian Arctic Railway Company, 2004.

1 Overview

The Yukon is a vast geographic area, rich in natural resources, sparsely populated, and anxious to promote further economic development. While Alaska is looking to expand and integrate its current, albeit limited, railway infrastructure to the rest of North America, the Yukon Territory currently has no freight railways and limited roadway infrastructure, save for the Alaska Highway which only serves Yukon's western border. The Yukon government believes that this proposed rail line might serve as the catalyst that will enable the economic development of other infrastructure, including gas pipelines, electric utility grids, telecommunications networks, and roads. Indeed, Canada will not realize the full benefits from Yukon's vast wealth of mineral resources as long as those mineral resources remain inaccessible.

Government officials, civic leaders, and businesses in Alaska believe that an all-rail link to the lower 48 States would provide cheaper and faster transportation services between Alaska and the rest of the North American economy. To a consumer, the price of goods represents the sum of the cost of producing and transporting those goods. Consequently, by lowering transportation costs, Alaska hopes to extend the distance at which consumers are indifferent to the delivered cost of Alaskan-produced goods versus goods produced in other regions. Furthermore, lowering the transportation costs for inbound goods to Alaska will decrease the cost of living for Alaskan citizens, improve the quality of life in that region, and promote economic growth.

GOVERNMENT HAS A SIGNIFICANT ROLE TO PLAY.

In 2002, the United States government authorized the expenditure of six million dollars to undertake a detailed feasibility study regarding the proposed rail link connecting the existing Alaska Railroad to the rest of the North American rail system.[1] The United States recognizes that Canada will also benefit from this new transport corridor. Consequently, the U.S. authorization of funds is contingent on the Canadian government also authorizing funds to support the same study. This requirement for joint funding is not surprising in that the eventual success of the project will require close cooperation between public and private sectors on both sides of the border.

The large and complex nature of this project argues for active engagement by the Canadian government. The investment risk associated with bureaucratic lethargy, insufficient market demand studies, and lack of detailed planning may discourage any development of this rail link by private investors. Even if the private sector were to pursue development of the rail line independent of the government, the size, complexity, and diversity of the constituencies associated with this project virtually ensure that any private solution would not maximize public benefits for Northern Canada.

---

[1] 2002 Roads to Resources Bill.

Information is a public good and the potential benefits of the Alaska-Canada Rail Link should be documented and published by the government. Large infrastructure projects such as this proposed rail line are exactly the kind of projects that national governments have historically supported and promoted.

Assessing and documenting the development effects of corridor development at local, regional, and national levels will not occur without government involvement. It is clearly the role of the relevant governments to make decisions about what weight to place on the various economic and non-economic benefits and costs that corridor development may bring.

OBJECTIVE

THE POTENTIAL BENEFITS OF THIS PROJECT DESERVE CAREFUL EVALUATION.

Previous feasibility studies of this project are either very old, such as the 1942 report by the U.S. Army Corps of Engineers, or present very broad analyses of costs and benefits, such as recent reports by the Canadian Arctic Railway Company and the IBI Group. The historical collection of studies, analyses, and papers are collectively insufficient to justify building the railroad; however, they do present a number of intriguing possibilities that merit further research and will serve as good source material for a future comprehensive feasibility study. As an interim step, the purpose of this paper is to assess the areas of economic benefits associated with the project to assure policy makers that funding a future detailed feasibility study is a prudent use of public funds and an appropriate role for government.

The objectives of this paper include:

- Discuss dramatic and consequential changes in the global economy, in the transportation industry, and in resource markets that impact the economics of this project.
- Offer an in-depth analysis of current transportation flows and trends and highlight the potential benefits of the Alaska-Canada Rail Link to the global transport network.
- Estimate future resource development potential and resulting freight volumes that may utilize the future Alaska-Canada Rail Link.

1 Overview

THIS PAPER OUTLINES COMPELLING EVIDENCE SUPPORTING THE NEED FOR A DETAILED FEASIBILITY STUDY OF THE PROPOSED ALASKA-CANADA RAIL LINK.

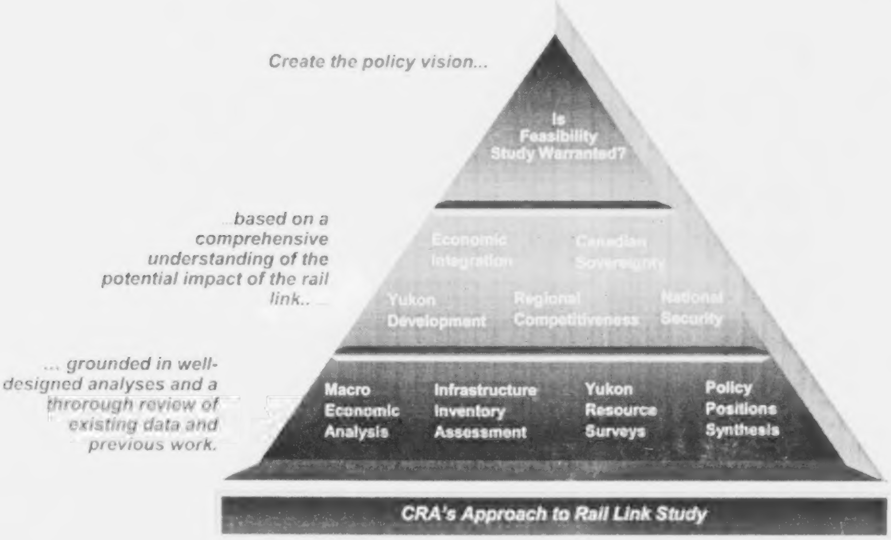
In considering the construction of a railroad from Alaska, through the Yukon, and on to northern British Columbia, CRA found sufficient evidence that such a project could yield substantial benefits to Alaska, the Yukon, and Canada by facilitating the development of natural resources, decreasing the cost of new gas pipeline construction, promoting a regional energy strategy, and supporting public policy objectives. These benefits need further definition and documentation.

In the following chapters, our team of economists and experts presents its factual analysis. CRA concludes that the preponderance of evidence justifies funding additional studies of this rail link for the purpose of clarifying and strengthening the existing body of work, rigorously documenting the expected costs and benefits of each alternative, identifying issues, suggesting resolutions vis-à-vis potential encumbrances, and detailing an implementation strategy. The implementation strategy should clearly define the expected roles for the various public and private stakeholders and suggest rules of engagement that will regulate the future construction and operation of any infrastructure that might occur.

APPROACH

Our overall approach to understanding the potential benefits of the Alaska-Canada Rail Link is summarized in exhibit 2. The following sections preview the contents of each chapter.

Exhibit 2. CRA's analytical framework for the Alaska-Canada Rail Link study


Create the policy vision...
Is Feasibility Study Warranted?
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Regional Competitiveness
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Macro Economic Analysis
Infrastructure Inventory Assessment
Yukon Resource Surveys
Policy Positions Synthesis
CRA's Approach to Rail Link Study

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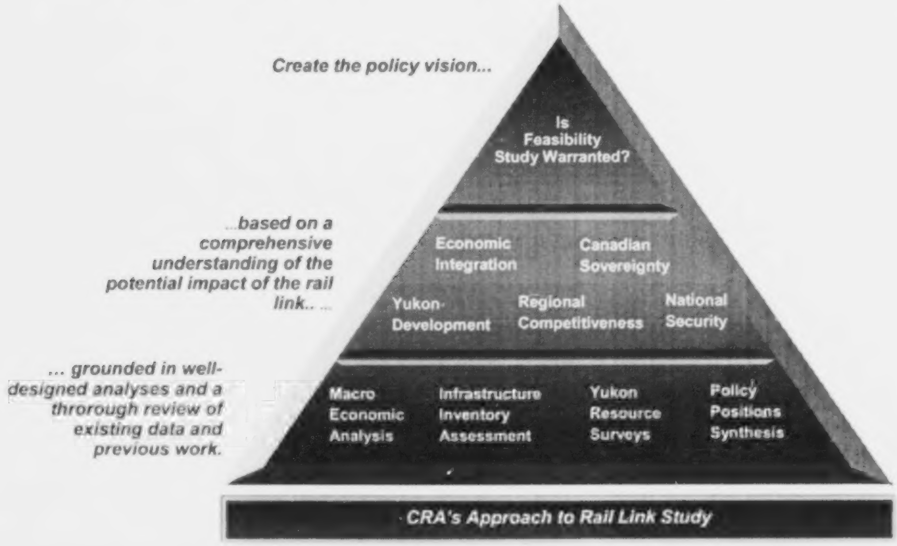
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CRA's Approach to Rail Link Study

1 Overview

RECENT AND CONTINUING CHANGES IN THE GLOBAL ECONOMY ARE INCREASING THE DEMAND FOR YUKON AND ALASKAN NATURAL RESOURCES.

Chapter two surveys the international economic and political framework that sets the stage for future development in the Yukon and Alaska. Specifically, we examine the reductions in trade barriers, the benefits of WTO and NAFTA, and economic privatisation and liberalisation. We also consider the role Asia is playing in fuelling global economic growth, and highlight the political security of the Yukon and Alaska as a key competitive advantage in the global marketplace for minerals. Chapter three outlines the region's positive economic future and provides an analysis of major mineral resources, mining, and energy development potential.

GLOBAL ECONOMIC GROWTH COUPLED WITH THE ONGOING REALIGNMENT OF PRODUCTION AND CONSUMPTION WILL CONTINUE TO STRAIN MANY TRANSPORTATION SYSTEMS TO THE POINT OF GRIDLOCK.

Increased shipping costs may curtail future economic growth. In the fourth chapter of the report, we assess the latest research in transportation and the expected growth and congestion. Using two seminal studies, the American Association of Highway Transportation Officials (AASHTO) Freight Rail Bottom Line Report and the World Business Council for Sustainable Mobility Report, as a backdrop, we illustrate the implications of infrastructure demand for the Yukon and Alaska. We also examine how global trends in modal choices further reinforce the potential benefits of the Alaska-Canada Rail Link.

ECONOMIC BENEFITS WILL RESULT FROM COORDINATING THE DEVELOPMENT OF NEW INFRASTRUCTURE THROUGH THE YUKON, INCLUDING MINES, PIPELINES, HIGHWAYS, RAILWAYS, ELECTRICITY GRIDS, AND SUPPORTING INFRASTRUCTURE.

Chapter five provides an analysis of the proposed Alaska-Canada Rail Link in the context of the existing transportation infrastructure, looking specifically at the highways, pipelines, ports and waterways, and existing railways in the region. We then outline the possible specifications for the proposed rail link and evaluate the potential benefits that building a coordinated transportation corridor might bring.

1 Overview

Freight and the Public Sphere

Managing national and international trade and freight requires the attention of governments at every level, from heads of state negotiating global pacts on trade, to municipal councils regulating the hours during which trucks can rumble through their streets.

The challenge of freight transportation is to maintain operational efficiency yet minimize the many negative side effects of the system. This means freight operators must navigate political interests, public concerns, hazards to safety and tranquility, land-use limitations, and environmental problems, while still making their pickups and deliveries on time. Because of the volume and importance of freight, it poses some of the most demanding and acute challenges to sustainable mobility.

THE PROPOSED ALASKA-CANADA RAIL LINK WILL GENERATE NON-ECONOMIC BENEFITS AND SUPPORT PUBLIC POLICY OBJECTIVES.

In chapter six, we provide an overview of significant policy issues pertaining to the construction of a Canada-Alaska Rail Link and assess the potential public benefits associated therewith. The chapter highlights the important role that government will need to play in this effort as well as the implications that the railway would have for defence and international security.

IT IS IMPORTANT TO INITIATE A DETAILED FEASIBILITY STUDY OF THE PROPOSED ALASKA-CANADA RAIL LINK TO RESPONSIBLY EQUIP CANADA TO COMPETE IN THE NEW WORLD ECONOMY.

Our final chapter draws conclusions about the costs and benefits of building the rail link while also identifying those issues we believe require additional investigation and research. We end the chapter with our recommendations on how the project might proceed.

A successful Alaska-Canada Rail Link will serve the needs of numerous potential customers and communities creating the potential for coordination problems common to such large-scale projects. The Alaska-Canada Rail Link project should be planned carefully to ensure that all parties end up with a globally optimum solution balancing their individual preferences.

This coordination function will require the active involvement of representatives of relevant governments. A project as far-reaching as the Alaska-Canada Rail Link promises to have broad, multi-faceted impacts, affecting communities, regions, and nations in ways that are hard to encompass within a narrow, discounted-cash-flow view of the world. Even benefits that can be accounted for with conventional cash-flow valuation, such as of lowered transportation costs and enhanced development of known resources, may be influenced by unpredictable and fundamental changes in community development and economic activity as previously inaccessible areas are opened to development through the creation of the Rail Link.

The federal governments of the United States and Canada can take a valuable first step toward addressing coordination problems by funding the detailed feasibility study of the Alaska-Canada Rail Link. This study would allow interested parties to begin their planning processes based on a common base of well-founded analysis. While the Canadian government may never be justified in contributing substantial funds toward the construction of the rail line, it is reasonable for the government to devote resources to shaping this project's definition, detailing the business case, facilitating and coordinating the efforts of others, and providing economic incentives to create conditions favourable to attract private funding. We believe the U.S. and Canadian governments will be able to jointly design a comprehensive feasibility study to meet those objectives. By sponsoring such a study, governments will encourage private investors to take a hard look at this opportunity. Investors will more readily be able to make informed decisions regarding the true costs and benefits associated with the future development of the Alaska-Canada Rail Link.

2 Global Factors Favour Yukon and Alaskan Development.

Mobility Enables Economic Development.

"The division of labour is limited by the extent of the market," writes Adam Smith, describing how the specialization of production can lower the cost and increase the variety of available goods. One of the greatest barriers to the division of labour has always been the cost and difficulty of transportation. Transportation capabilities also determined how large cities could grow. The average city in ancient Greece is said to have had a population of only about 10,000. This was the most that could be supported by the transportation systems that connected these cities and their immediate hinterlands. But the population of ancient Rome managed to grow to approximately 1,000,000 because the Romans were able to transport large quantities of grain from Egypt using high-capacity (for their day) ships.

Inexpensive, reliable freight transportation has also transformed otherwise worthless substances—such as remotely located deposits of low-grade iron ore—into valuable resources. Indeed, it is not an exaggeration to state that personal and goods mobility has made our present globalized economy possible. While such institutional and political changes as the dismantling of various trade barriers have been necessary for globalization, without the improvements in personal and goods mobility that characterized the last half of the 20th century, such changes would have been meaningless exercises. There would have been no way for trade to increase.

Some contend that globalization is not a "good," something that creates net benefits. While there is certainly room for debate about the range and desirability of the consequences of globalization, it is important to recognize that high-quality, efficient freight systems facilitate sustainable development. Indeed, if freight systems were less efficient in enabling people around the world to find markets for their goods and to purchase products from distant lands, then everyone's standard of living would suffer. The poor around the world would be hurt, not helped. There would be more famine and disease, not less. Environmental devastation in developing countries would be increased, not reduced, as people struggled to provide for themselves without the goods they import from the outside world.

INTRODUCTION

The proposed Alaska-Canada Rail Link will increase access and mobility. Creating a corridor linking Alaska and northern Canada to the world's largest and most efficient freight rail network will facilitate mobility between the United States and Canada and strengthen Yukon's and Alaska's connections with the rest of the world. Increased freight access will place the region's vast natural resources in closer reach of the fastest growing global markets.

What are the benefits of increased mobility in today's global economy? What are the "rules of the game" that will govern the Yukon and Alaskan economies? The proposed Alaska-Canada Rail Link can only be fully analyzed within the context of the global economy and new market patterns. In this section, we explore how global economic trends create opportunities for countries that embrace platforms of openness and mobility. By understanding global economic, political, and security trends, we will identify markets needs in which the Yukon and Alaska may participate. We will also discuss the potential downsides of an increasingly interdependent global economy and contemplate how the Yukon and Alaska are positioned to help guard against these risks.

2 Global Factors Favour Yukon and Alaskan Development.

With the creation of the rail link, the Yukon and Alaska will become more involved in a global economy characterized by the following broad trends:

Reduction in trade barriers—The World Trade Organization (WTO)'s success in lowering barriers to trade, decreasing and eliminating trade tariffs, and enforcing agreements has advanced the creation of a unified world market. Similarly, the North American Free Trade Agreement (NAFTA) has reinforced economic integration on that continent by further lowering trade barriers between Canada, the United States, and Mexico further still.

Privatisation and liberalisation—The world economy has undergone a revolution as government-owned and/or government-regulated industries give way to privatisation and deregulation. Government subsidies in many industries are being significantly reduced or eliminated. Radical change in national economies is exemplified by the collapse of the planned economy models in China, Eastern Europe, and Russia. Privatisation, deregulation, and the withdrawal of subsidies jumpstart economies and boost the growth of GDP with competition-driven efficiency and free trade.

Asian economic growth—The power and importance of economic privatisation and liberalisation coupled with lower trade barriers are best demonstrated by Asia's, and particularly China's, remarkable economic growth. Success in the Asian economies has increased the demand for commodities and commodity prices. Alaska and the Yukon are located across the Pacific Ocean, relatively close to Asia, strategically positioning them to supply the new Asian economies with needed commodities.

Security and interdependence—As countries become more dependent upon one another economically, they are more at risk to disruptive events and crises around the world. Large fluctuations in supply and demand, devaluations in currencies, and other macro-economic crises in one part of the world can register almost instantly across the globe. The impact can range from a dampening of the stock market to the eradication of an economic base. As investors place a premium on secure trading partners, Yukon and Alaskan commodities will look like especially good bets.

2 Global Factors Favour Yukon and Alaskan Development.

REDUCTION IN TRADE BARRIERS PROMOTES THE INTERNATIONAL EXCHANGE OF GOODS.

Pivotal events in the late twentieth century led to the wide-scale realization of free trade. The WTO and NAFTA were important factors in reducing barriers to trade that persisted for decades between nations. By enforcing bilateral and multilateral international agreements, the WTO and NAFTA lessened the uncertainty of trade. The WTO and NAFTA decreased the cost of doing business by lowering tariffs among member countries and improving economic inefficiencies caused by tariff-related distortions. As a result of these efforts, the world more closely resembles a unified market where competitive forces lead to efficient outcomes. Opportunities once blocked by trade barriers are now available. Free trade contributes to a wealth creation cycle by encouraging demand for goods and inputs and thereby raising income; increased income then pushes demand even higher leading to still higher incomes.

WTO SUCCESSES CREATE NEW MARKETS AND OPPORTUNITIES FOR CANADA.

The WTO has been instrumental in liberalising trade. The central purpose of the WTO is helping trade flow as freely as possible while limiting undesirable side effects. The WTO achieves these goals by removing or reducing obstacles such as trade tariffs and by establishing and maintaining trade regulations. Many WTO agreements require governments to publicly disclose policies and practices. The regular surveillance of national trade policies through the Trade Policy Review Mechanism provides a means of encouraging transparency both domestically and multilaterally. This oversight by the WTO promotes development and trade by reducing the risks sometimes associated with international trade and overseas investment.

The WTO is the successor to several successful General Agreement on Tariffs and Trade (GATT) rounds of multilateral trade negotiations after World War II, and produced dramatic reductions in trade barriers. Specifically, since the 1947 establishment of the General Agreement on Tariffs, average tariff rates were reduced from 40 percent to 4 percent in 1999.[2] Worldwide deregulation in the financial and product markets, the internationalisation of capital and financial flows, and the accelerated development of key technological innovations, such as containers and modern telecommunication, have increased competition in world markets and led to more trade and international investment. For example, whereas world production grew by an annual average of 1.5 percent in the period 1990 to 2000, trade rose by 6 percent and foreign direct investment by 23 percent during the same period.[3]

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[2] Senti, Richard 2000, WTO – *System and Functionality of the World Trade Organization,* Zurich: Schulthess.

[3] World Bank 2002, *World Development Indicators*, Data on CD-ROM, Washington, D.C., World Bank.

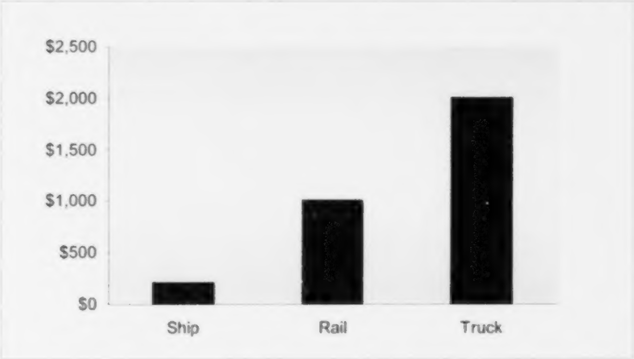
2 Global Factors Favour Yukon and Alaskan Development.

In addition to lowering tariffs through the Uruguay Round talks, the WTO dramatically increased the percentage of binding tariffs or tariff ceilings. The Uruguay Round increased the percentage of binding tariffs, tariffs that are committed and difficult to increase, for developed countries from 78 percent to 99 percent, for developing countries from 21 percent to 73 percent, and for transition economies from 73 percent to 98 percent.[4] The WTO estimates that its 1994 Uruguay Round trade deals added between $157 and $614 billion to world revenue. Moreover, economists have estimated that cutting trade barriers in agriculture, manufacturing, and services by one third would increase the worldwide revenue by $883 billion—that is "equivalent to adding an economy the size of Canada to the world economy." Clearly, trade increases wealth.[5]

Cheap Freight Rates are the Key to the Global Economy.

The costs of high-volume transportation between essentially any two ports in the world are very low. For manufactured goods, costs are on the order of $0.01/tonnekilometer. For comparison, a 1000-kilometre movement of a container costs about 10 times this by truck and about 5 times this on the best rail intermodal service. The modal comparison shows that ocean transport is cheaper than ground transport, but fails to convey how cheap that service really is. Consider what it means to the consumer for companies to be able to ship a container halfway around the world for, say, $3,600. A container can hold about 20 tonnes of merchandise, so the cost per tonne would be on the order of $180 and the cost per kilogram would be less than $0.18. Compare these two figures to the cost of, say, a $48 book marketed in the United States by a European publisher or a $240 electronic device manufactured in Japan. The value of other manufactured goods can be higher, about $24,000/tonne for automobiles, much more for computers and consumer electronics. Shipping products like these internationally adds less than 1 percent to their cost, which is why international shipping is growing so rapidly, and consumers can enjoy a global variety of goods and products.

Exhibit 3. Approximate cost of a 1,000 kilometre container move



Source: CRA estimates.

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[4] The WTO, "Understanding the WTO", Third Edition.

[5] "Trade Raises Incomes", from WTO Web site.

2 Global Factors Favour Yukon and Alaskan Development.

The WTO and other initiatives enable production and investment to flow to the most efficient locations. This free flow of capital creates opportunities for low-income countries such as China to grow and industrialize rapidly without the risk of being cut off from export markets. These initiatives are a strong contributing factor to world economic growth and to the growth in demand for basic commodities. Given the growth in demand for commodities implied by trade liberalisation, Alaska and the Yukon should evaluate their position in this new trade environment and take the appropriate actions.

NAFTA HAS INCREASED NORTH AMERICAN TRADE.

North American Trade Has Been Bolstered by U.S.-Canada FTA and NAFTA.

The United States and Canada signed the U.S.-Canada Free Trade Agreement (FTA) on January 2, 1988. Although this initial agreement eliminated tariffs and many other trade barriers between the two nations, it was not until 1998 that all tariffs were removed. In 1992, Canada, Mexico, and the United States launched NAFTA. The agreement was similar to the FTA and was a milestone in several respects. NAFTA created the world's largest free trade area with coverage that was more comprehensive than in most other regional trade agreements. The scope of NAFTA includes merchandise trade, the investment industry, services sector, labour markets, the environment, and the settlement of disputes. NAFTA was also the first comprehensive free trade agreement between advanced economies and a developing economy.

Following the creation of NAFTA, trade sharply accelerated among member countries. This increase led to a relative increase in intra-NAFTA trade versus extra-NAFTA trade. Exhibit 4 shows trade with NAFTA partners as a percent of total trade for the United States, Canada, and Mexico before and after NAFTA agreements went into effect. Perhaps more significantly, the composition of trade flows also changed, as vertical specialization (the amount of imported goods embodied in exports), intra-industry, and intra-firm trade among the NAFTA partners increased substantially. The agreement played a significant role in the growth of trade in the region. It has been estimated that in Mexico between one-fourth and one-half of the increase in exports to the United States can be attributed to the country's preferential access under NAFTA.[6]

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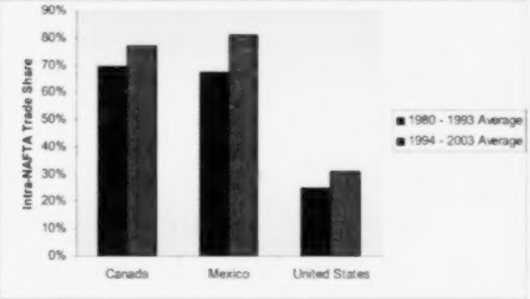
[6] Romalis, 2002; Agama and McDaniel, 2002; and Wall, 2003.

Exhibit 4. Intra-NAFTA trade share has increased.



Source: IMF, Direction of Trade Statistics.
Note: Total trade is sum of merchandise exports and imports.

Improved infrastructure amplifies NAFTA benefits.

Rapid trade growth in North America during the 1990s has focused international attention on the development of north-south transportation links. For example, while industry insiders for years have talked about an impending east-west rail merger, every major railway merger has resulted in expanding systems north and south. The Canadian National purchased the Illinois Central Railroad, linking Canada to the Gulf Coast. The Kansas City Southern Railroad purchased the TexMex and the TFM, integrating the major Mexican rail company with the United States. Likewise, in the eastern United States, Conrail was divided up and merged with two rail companies based in the south: CSX and Norfolk Southern. As part of the Conrail merger, the U.S. Surface Transportation Board granted Canadian Pacific Railway a number of operating concessions, including critical access to New York City.

Despite large increases in freight volumes, modal shares of freight transportation in North America have remained relatively constant. With the exception of Canadian exports to Mexico that rely more heavily on marine transportation, North American freight transportation is dominated by trucking. Rail also plays a greater role in Canadian and Mexican export cargo than in the United States. Canada and Mexico export relatively natural resources and bulk agricultural commodities. Currently, freight rail transports 16 percent of the United States cross-border NAFTA trade.[7]

The success of NAFTA has stimulated exchange between the three countries while highlighting impediments to trade that are not part of this agreement. Transportation issues have become more visible as logistics costs become the only remaining barrier to trade. The success of NAFTA has increased the demand for improved transportation infrastructure and services and greater integration of the Canadian, U.S., and Mexican transportation systems.

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[7] AASHTO Bottom Line report.

WTO economic research demonstrates the importance of improved infrastructure on the returns to free trade. The research concluded that enhancing transport efficiency by 10 percent will increase trade by over 6 percent.[8] It also found that by lowering tariffs 10 percent, trade would improve by 12.5 percent, highlighting the importance to Canada of promoting efficient and low-cost transportation solutions.

To take full advantage of free trade, Canada needs to supplement NAFTA with investments in infrastructure. In Canada's case, NAFTA-related trade will increase as a result of creating new infrastructure in regions lacking adequate transportation options such as the Yukon. The Yukon shares a long border with Alaska. Canada's "other border" has unrealized trade potential.

ECONOMIC PRIVATISATION AND LIBERALISATION MOTIVATE COMPANIES TO SEEK LOWEST COST INPUTS.

The post-WTO and post-NAFTA economy has challenged the viability of government-run and government-regulated industries. Consequently, over the past few decades there has been a shift from centrally planned economies to privatised and deregulated ones. Economic institutions have been liberalised. Private companies and markets, not government initiatives, are regulating production and consumption choices. Governments have also reduced the use of subsidies that enabled inefficient industries to survive. Liberalisation within a national economy creates opportunities for low-cost producers from outside the country. Free markets favour the production of goods at the lowest cost over the promotion of national industries or "buy at home" philosophies. As a result, economic privatisation and liberalisation lead to greater economic efficiency, increased trade between countries, and long-term economic growth.

China, Eastern Europe, and the former Soviet Union are examples of countries with failed planned economies. China's strong economic performance since moving away from state-run industries has been well documented. In fact, China's non-state sector has grown much faster than the state sector. State-owned enterprises' share of aggregate production has declined from 78 percent in 1978 to 69 percent in 1984, and then to 34 percent in 1994.[9] Moreover, China provinces with higher privatisation rates had more economic growth than provinces with low privatisation. The case of China shows that openness to foreign trade increases economic growth.[10]

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[8] Nordas and Piermartini, 2004.

[9] Sachs and Woo, 1997.

Mining and transportation, the two industries of primary relevance to this paper, have been undergoing dramatic restructuring over the last 25 years. This restructuring has resulted in lower costs, more competition, improved products, and innovative product offerings.

WORLD ECONOMIC GROWTH IS BEING FUELLED BY ASIA.

The combined effects of booming world population and rising consumption per capita increases are creating unparalleled demand for scarce natural resources. Shrinking resource supplies cause increased commodity prices. The U.S. Census Bureau projects the world population will grow by about 46 percent from 2004 to 2050.[11] With this growth, the prices of mineral commodities can be expected to increase substantially. As such, the economic dynamics of the mining industry will change significantly. Mineral properties that were once overlooked due to cost impediments will likely become sought after locations. The ground is shifting. As demand increases, what was once uneconomic is quickly becoming economic.

Since 2002, the world economy has been steadily recovering from a global recession. The economic growth rate for 2004 was 5.0 percent; for 2005 world GDP is expected to grow at 4.3 percent. The growth rates of emerging markets and developing countries are much higher than those of advanced economies. Similarly, the import/export volume is higher in emerging markets and developing countries. For example, while the world GDP growth rate was 2.7 percent from 1990 to 2002, the GDP growth rates for East Asia and Pacific and South Asia were 7.3 percent and 5.4 percent, respectively. Within East Asia and South Asia, China and India's GDP growth rates were 9.7 percent and 5.8 percent, respectively, for that same time period.[12]

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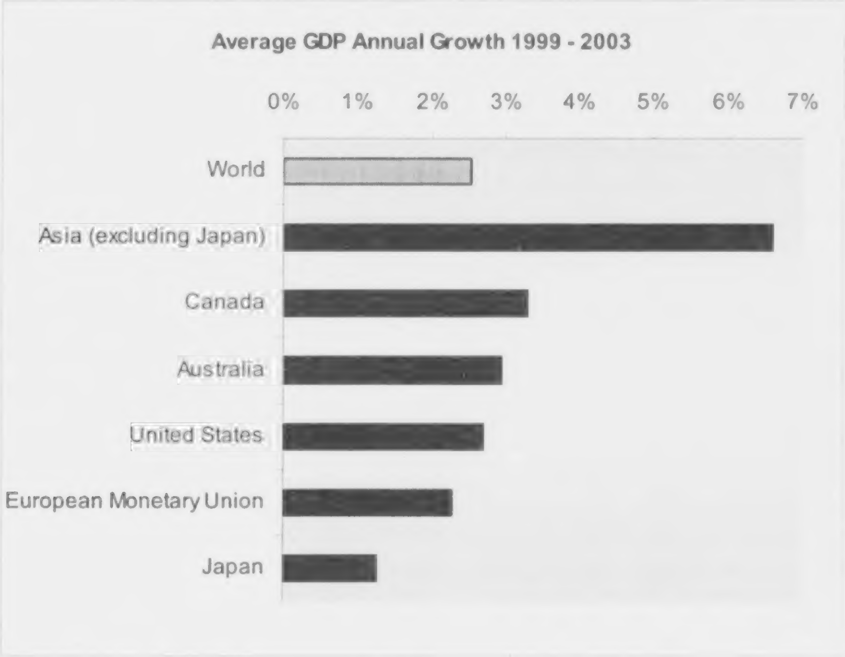
[10] Tian, 2000.

[11] U.S. Bureau of the Census, International Data Base.Total Midyear Population for the World: 1950-2050.

[12] World Bank, 2004 World Development Indicators.

Exhibit 5. Asia is the growth engine of the world economy.



Source: *World Development Indicators (WDI)* database, Aug. 2004.

These differences in GDP growth rates are more dramatic for the manufacturing industries. While the world manufacturing GDP growth rate for 1990 to 2002 was 2.9 percent, the growth rates for East Asia and Pacific and South Asia were 9.8 percent and 6.4 percent, respectively. China and India's manufacturing GDPs grew at 11.9 percent and 6.6 percent a year, respectively.[13]

More recently, GDP growth in emerging Asia was projected to remain at 7.25 percent in 2004. A large part of this Asian growth is attributed to China and India. China's booming activity is being fuelled by very rapid investment and credit growth. India's growth is underpinned by global expansion and supportive monetary conditions.

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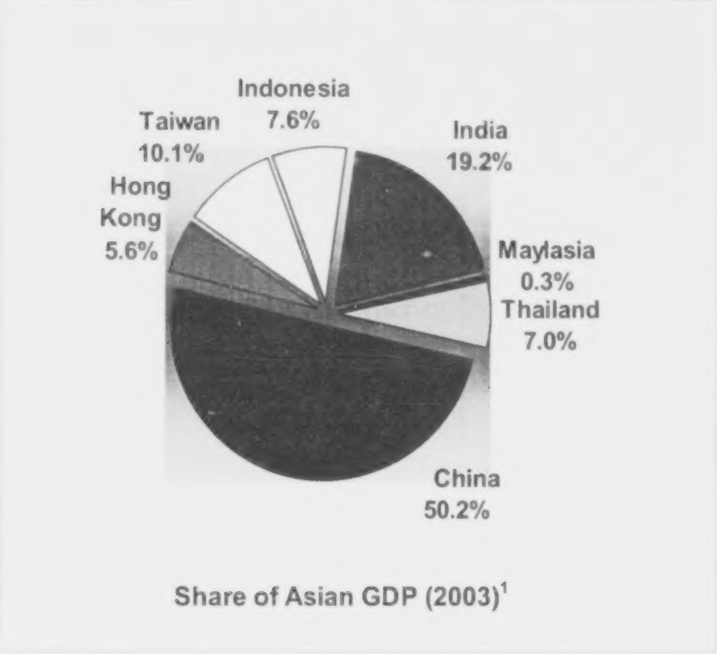
[13] World Bank, 2004.

2 Global Factors Favour Yukon and Alaskan Development.

Exhibit 6. China dominates the Asian economy.

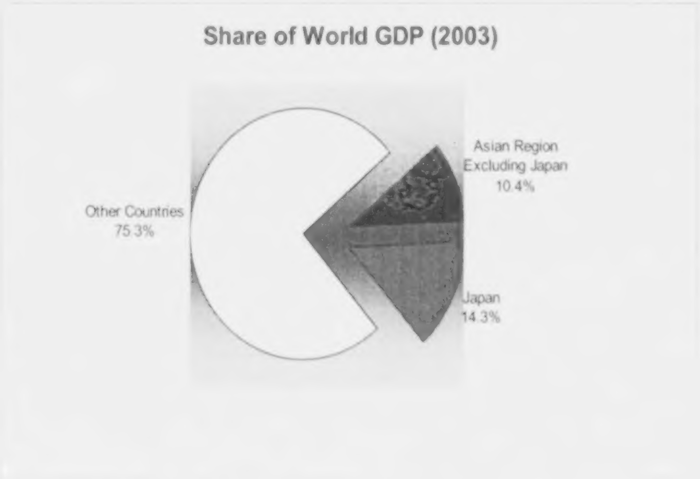


Share of Asian GDP (2003)[1]

Source: Japanese Statistical Bureau and Asian Development Bank.

[1] Asian region not including Japan

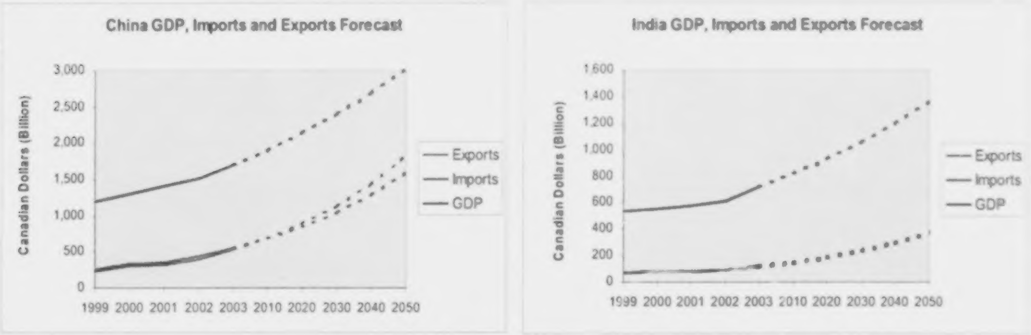
Exhibit 7. Asia comprises a quarter of the world economy.


Share of World GDP (2003)

Source: Japanese Statistical Bureau and Asian Development Bank.

2 Global Factors Favour Yukon and Alaska Development

Exhibit 8. China and India are poised for exponential economic growth.

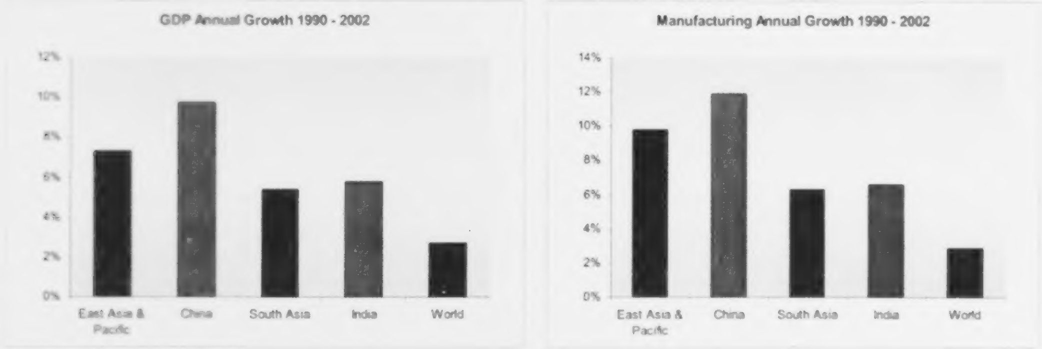


Source: *World Development Indicators (WDI)* database, Aug. 2004.

Notes:
1. GDP forecast of China based on growth rate of 4.7 percent, as used in a Goldman senior economist's model (*Forecast sees China topping global economy by 2050*, Daily Times, Dec. 13th, 2004).
2. Export and import forecast of China based on the growth rates of 11 percent and 13 percent, respectively.
3. GDP, export, and import forecast of India based on growth rates of 6.6 percent, 13 percent, and 12 percent, respectively.

The global, the East Asian, and the South Asian GDP growth rates characterize a growing world demand for manufacturing inputs. The impressive manufacturing GDP growth rates of East Asia and Pacific and South Asia are particularly relevant to Alaska and the Yukon due to the proximity of many of those countries to Alaska and the Yukon.

Exhibit 9. Both overall and manufacturing GDP growth in Asia exceeds world average.



Source: *World Development Indicators (WDI)* database, Aug. 2004.

Annual increases in GDP per capita also impact total demand. From 1980 to 2003, world per capita GDP increased by 32 percent from $6,018 in 1980 to $7,957 in 2003. By 2025, per capita GDP is projected to be $12,562.[14]

Exhibit 10. Asian imports and export activity is growing even more rapidly than GDP.

	Annual Growth (2002-2003)		
	GDP	**Exports**	**Imports**
Asian Region Excluding Japan	**7.4**	**11.7**	**11.7**
China	9.1	34.6	39.8
India	8.1	N/A	N/A
Thailand	6.7	14.0	13.1
Maylasia	5.2	11.6	4.8
Indonesia	4.1	N/A	N/A
Taiwan	3.2	9.9	12.6
Hong Kong	3.2	11.7	11.5
Japan	**2.7**	**23.0**	**14.0**

Sources: *Key Indicators Poverty in Asia: Measurement, Estimates, and Prospects*, Asian Development Bank, 2004 and *World Development Indicators (WDI)* database, Aug. 2004.
N/A – data not available.

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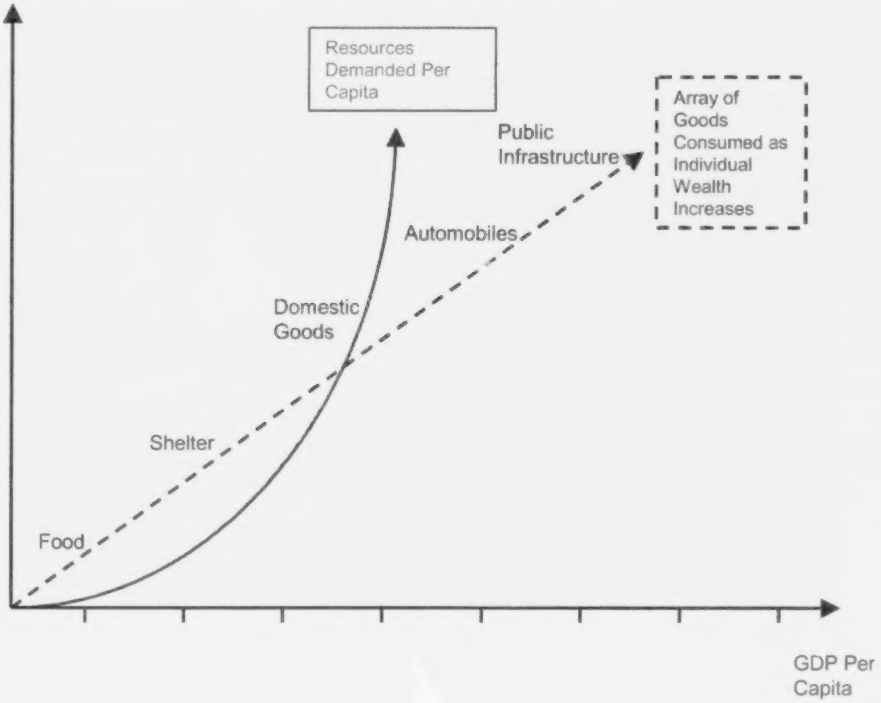
[14] U.S. Bureau of the Census, International Data Base, Global Insight World Forecast.

2 Global Factors Favour Yukon and Alaska Development

As GDP per person, and consequently income per person, continues to increase, demand for goods will generally grow as well. We postulate that the relationship of GDP per capita to demand for manufactured goods is non-linear. As individuals reach different thresholds of income, they will change their mix of demanded goods toward more sophisticated and larger capital goods. These capital goods, such as appliances, automobiles, and public infrastructure, require relatively more mineral resources to produce than basic consumables. As a result, the demand for commodity inputs per person will increase at a higher rate than average GDP per person. (See Exhibit 11)

Exhibit 11. GDP per capita growth rates will amplify commodity volumes demanded per capita as individual wealth increases.

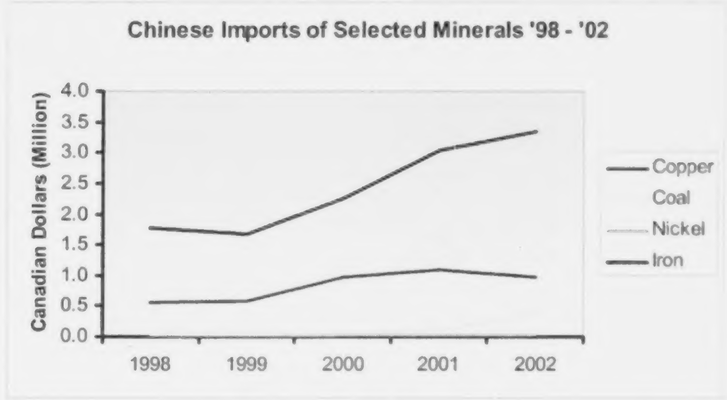


With the world's population growing, each new person will demand a certain amount of goods and associated raw materials and mineral commodities to manufacture those goods. The demand for goods will be exacerbated by the expected increase in personal income as measured by GDP per person. With more income, each individual will have the capacity to consume more goods per capita. The multiplicative effect of a growing population and a population growing richer will place immense strains on the world's supply of raw materials. Supply and demand economics predict that the prices of raw materials will rise substantially, creating an economic incentive for Canada to meet the world's growing needs.

IMPLICATIONS FOR YUKON AND ALASKA TRADE DEVELOPMENT

Globally there is a documented growing demand for commodities, creating opportunities for the Yukon and Alaska's commodity industries. The geographical proximity of Yukon and Alaska to fast-growing demand centers in Asia must also be considered when drawing implications for Yukon and Alaska trade development. China imported 61 million metric tons of iron ore between January and May of 2003. For those same months in 2004, China imported 81.5 million metric tons of iron ore; this is an increase of demand of 33.7 percent.[15] Exhibit 12 demonstrates the substantial growth in demand in China for commodities the Yukon and Alaska might develop. Further analysis is needed to evaluate the demand growth for Alaska and the Yukon's other important natural resources.

Exhibit 12. Chinese imports have risen for minerals the Yukon may export in the future.



Source: *International Trade Statistics*, International Trade Center

Rapid growth of the world's manufacturing industry is creating a robust market for the Yukon's unearthed commodities. Alaska and the Yukon's most potentially significant commodities are iron, platinum, palladium, tungsten, barite, zinc, lead, gold, coal, copper, nickel, and molybdenum. The production of all of these minerals rose substantially in a ten-year analysis (1991-2000 for most minerals)—most with large double-digit ten-year growth rates. For example, the production of platinum and the production of copper increased by 50 percent and 31 percent, respectively, within ten years. This strong growth of production indicates a growing demand for these minerals. Exhibit 13 shows ten-year production growth rates for commodities with high-development potential in the Yukon.

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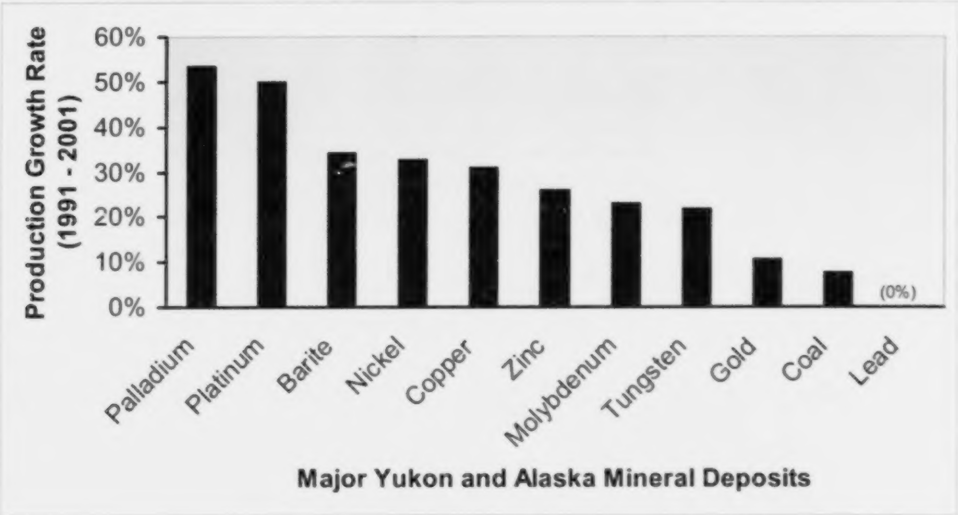
[15] *China Steel Monthly*, June 30, 2004, pp. 11-12.

Exhibit 13. World production of major Yukon and Alaska minerals has increased.



Sources: *Metal Statistics 2001*. Pinkham, Myra (ed.) The Bennett Group. *International Energy Annual 2002*, Energy Information Administration.
Note: Barite only found in Alaska.

Of the Yukon commodities, China could potentially be a large buyer of iron ore, copper, platinum, and gold. In 2002, China spent $3.3 billion, $1 billion, and $400 million Canadian dollars on iron ore, copper, and coal, respectively. Petroleum was the only commodity on which China spent more money. The increase in demand documented above is likely to continue given that the populations of China and India are forecasted to grow 10.7 percent and 27.0 percent, respectively, from 2003 to 2025.[16] As China's economy and manufacturing sector grow, the demand for these inputs will increase substantially—an opportunity from which the Yukon can profit.

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[16] "Total Population, China", "Total Population, India", World Forecast file, Webstract service.

2 Global Factors Favour Yukon and Alaska Development

ECONOMIC INTERDEPENDENCE CONTRIBUTES TO ECONOMIC FRAGILITY.

Secure trade routes help ensure stable financial markets. The security of trade routes has been an essential national security concern since ancient times. Indeed, much of history can be interpreted as competition for new markets, new sources of supply, and secure trade routes. Since the conclusion of World War II, there have been few sustained threats to international shipping lanes and air freight. However, periodic disruptions in supply chains can cripple a manufacturing plant and create ripples throughout an entire economy. For example, many chemical processing plants require a constant supply of raw materials to feed a continuous manufacturing process. In the absence of even one input, the plant must shut down. As a result, in-process inventory may harden in the pipes, valves may clog, and certain substances will deteriorate and be wasted. It often takes weeks of time and millions of dollars to clean and repair such a facility to prepare it for a restart.

The potential value and importance of the Yukon as an international exporter of minerals and other natural resources is reinforced by its position of security and stability vis-à-vis many of its would-be competitors. The value of security is amplified within the context of the current interdependency that characterizes the world's economy. Countries with limited natural resources must acquire the commodities they need from international sources to fuel their own economy. Consequently, countries and their respective economies are increasingly interconnected in today's fragile, global economy.

The interdependent quality of the global economy is evidenced by the significant implications that any one country's political or economic instability can have for the global economy as a whole. An isolated disruption in the trade of one commodity can create a ripple effect that extends to many other areas of the world economy. It is necessary to understand the importance of this side effect of globalization when considering the value of the Yukon and its natural resources.

2 Global Factors Favour Yukon and Alaska Development

Disruptions of Mineral Commodities in the former Soviet Union (FSU)[17]

The FSU has been a destabilizing influence in the world minerals markets (including aluminium, nickel, palladium, and steel) over the past several decades, by dumping excess production into the world markets and, to a lesser extent, releasing significant amounts of stockpiled metals. This dumping led to destabilized prices, production cutbacks, closures, and the delayed development of several commodities.

Though not as notable, the FSU also disrupted markets by curtailing production. In some instances, disruptions in production were caused by poor maintenance or lack of supplies, resulting in production stoppages. In other instances political interference led to the reduced availability of several commodities.

The preferential production of the most profitable commodities, such as lead, zinc, iron ore, and steel, frequently resulted in the subsequent curtailment of production of less profitable commodities.

The FSU occasionally withheld the production of platinum group metals to prevent creating a surplus supply, artificially supporting prices.

For more than five years, the FSU has demonstrated market discipline in the production and sale of most commodities. Partial privatisation and improved production in technology may account for some of this more stable behaviour.

China, by way of contrast, has not shown such discipline and has continued to disrupt world markets in various commodities such as tungsten, magnetite, barite, and certain minor metals.

As one might expect given the interconnectivity of the world's economy, stability is a major concern in international trade. Economic powerhouses like Japan, Germany, and the United States must ensure a reliable supply of imported minerals and other natural resources to fuel their economies. Unfortunately, countries rarely have the option to control for global instability in the supply of important commodities. Consider oil for example; over the past several decades repeated political conflict in the Middle East has affected the oil supply and consequently raised prices around the world. Since much of the world relies on the oil coming from the Middle East, the global economy is at the mercy of this instability. It is prudent to seek out and develop a portfolio of alternative sources to guard against instances of economic disruption.

Stability is a valuable Yukon attribute. Many of the commodities that the Yukon can potentially export are in high demand and are currently supplied in large part by less stable countries. Consider that 94 percent of the world's platinum supply comes from potentially risky sources such as South Africa, Russia, and Zimbabwe. Palladium and tungsten illustrate similar cases with 91 and 85 percent, respectively, of world production occurring in countries dealing with significant security issues. Exhibit 14 shows the current risk profile of minerals that are most likely to be developed in the Yukon in the short term.

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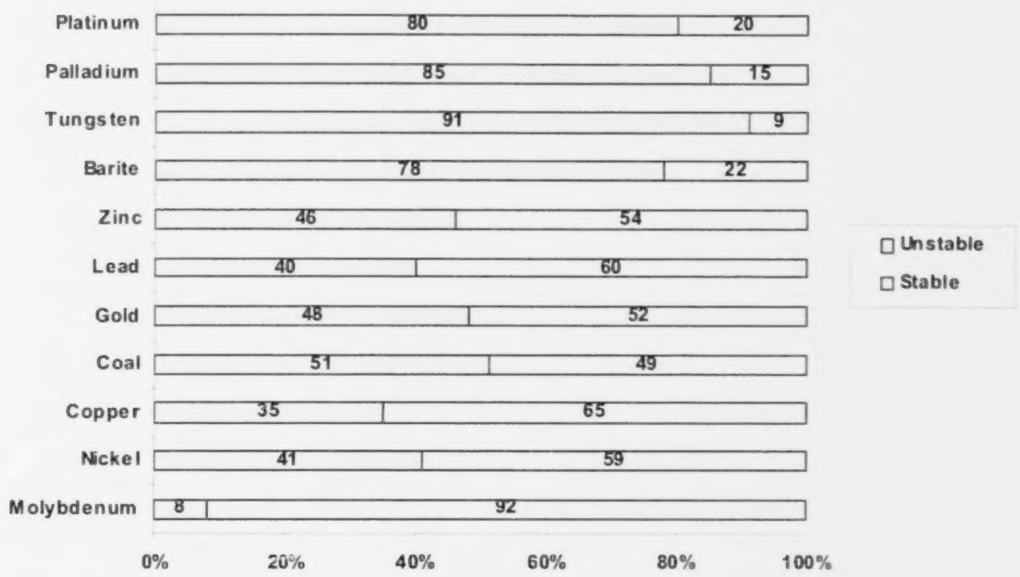
[17] CRA internal memorandum, December 7th, 2004.

Exhibit 14. A large portion of the global minerals supply comes from risky sources.



Sources: *Metal Statistics 2001*, Pinkham, Myra (Ed), The Bennett Group.; *Index Mundi, International Energy Annual 2002*, Energy Information Administration.

Note: CRA stability estimates based on bond ratings, and country risk premiums, and Transparency International's *Corruption Perceptions Index (CPI)*.

For the purposes of this report, country security has been determined by examining Transparency International's Corruption Perceptions Indexes (CPI), which rank countries on a scale of one to ten with ten representing the most secure. Experts rate each country by their understanding of the corruption evident in that country. Additionally, international bond ratings adjust their associated risk premiums to reflect each country's perceived security and stability. Exhibit 15 shows the implied risk to global suppliers of high development potential Yukon minerals.

2 Global Factors Favour Yukon and Alaska Development

Exhibit 15. Many Yukon minerals would compete with high-risk sources.

Unstable Suppliers of Minerals	Platinum	Palladium	Tungsten	Barite	Zinc	Lead	Gold	Coal	Copper	Nickel	Molybdenum
China			X	X	X	X	X	X	X		
Ghana							X				
India				X	X			X			
Indonesia							X		X	X	
Iran				X							
Kazakhstan					X				X		
Mexico				X	X	X			X		
Morocco				X							
New Caledonia										X	
North Korea			X								
Peru					X	X			X		X
Poland						X		X	X		
Russia	X	X	X				X	X	X	X	
South Africa	X	X					X	X			
Tanzania									X		
Turkey				X							
Uzbekistan							X				
Zimbabwe	X										

Sources: *Metal Statistics 2001*, Pinkham, Myra (Ed), The Bennett Group. *Index Mundi, International Energy Annual 2002*, Energy Information Administration.

Note: CRA stability estimates based on bond ratings, and country risk premiums, and Transparency International's *Corruption Perceptions Index (CPI)*.

The significant Yukon/Alaskan minerals (iron ore, platinum, palladium, tungsten, barite, zinc, lead, gold, coal, copper, nickel, molybdenum) are produced largely in 28 major countries. 18 of those countries, including Russia, North Korea, Kazakhstan, China, and Zimbabwe, can be classified as potentially unstable and/or in danger of economic collapse. Human rights abuses in Ghana, a notable producer of gold, jeopardized the supply of this commodity in the 1990's. In addition to these 18 countries, many other unstable countries also contribute to the world mineral supply, though to a lesser extent. Elsewhere in Africa, for example, as well as in the Philippines and New Guinea, mines have been taken over and seized by the government, resulting in the disruption of production.

As a result of these kinds of geopolitical risks, foreign companies often hesitate to invest in unstable countries. Such is the case for Afghanistan, where outside investment in copper mining is limited despite the country's estimated reserves of 11 billion tons, constituting the largest copper mining area in the world.[18] The message of this example is clear: investors are most interested in securing natural resources from stable markets.

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[18] "Afghanistan 'to tout its copper mines.' " BBC News World Edition accessed on November 29, 2004 at http://news.bbc.co/uk/2/hi/buisness/2640211.stm.

2 Global Factors Favour Yukon and Alaska Development

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China			X	X	X	X	X	X	X		
Ghana							X				
India				X	X			X			
Indonesia							X		X	X	
Iran				X							
Kazakhstan					X				X		
Mexico				X	X	X			X		
Morocco				X							
New Caledonia										X	
North Korea			X								
Peru					X	X			X		X
Poland						X		X	X		
Russia	X	X	X				X	X	X	X	
South Africa	X	X					X	X			
Tanzania									X		
Turkey				X							
Uzbekistan							X				
Zimbabwe	X										

Sources: *Metal Statistics 2001*, Pinkham, Myra (Ed), The Bennett Group. *Index Mundi*, *International Energy Annual 2002*, Energy Information Administration.

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2 Global Factors Favour Yukon and Alaska Development

Globalization has brought a never-before-known level of interdependence to the world. Countries rely on each other for acquiring and disseminating vital natural resources. Canadian security enhances the inherent value of the commodities that might be harvested from Yukon reserves. There is little to no risk of economic and political dangers that can be found in many of Canada's would-be competitors. Consequently, Yukon resources will be particularly attractive in the global marketplace, helping to promote Canada's role as an important world trader.

SUMMARY

The impact of the WTO, NAFTA, and economic privatisation and liberalisation has created a world economy where trade between countries is nearly as effortless as trade within a country. The lowering of trade barriers and the reduction of subsidies has made trade less costly and thus more efficient leading to strong economic growth. Economic growth fuelled by free trade and population growth increases the demand for goods and commodities.

The world is consuming raw materials at an increasingly rapid rate because population growth and average personal incomes are both rising, thus creating an exponentially growing demand for durable goods. The Yukon is well positioned to meet this growing demand with its natural deposits of valuable ores. The Yukon will be competitive in the world market as manufacturers seek alternative sources of raw materials from politically and economically stable countries.

3 Regional Economic Development Opportunities

INTRODUCTION

In the last chapter, we discussed global conditions favouring enhanced Yukon and Alaskan participation in the world marketplace. Here we take a closer look at the Yukon and Alaska economies themselves.

Many of the justifications for the Alaska-Canada Rail Link rely, at least in part, on the suitability of Alaska and northern Canada region to take full advantage of the enhanced connectivity that this project will provide. An in-depth analysis of both the economies as a whole as well as of key industries is necessary to determine the speed and ease with which the Yukon, Alaska, and northern Canada may embrace and make full use of a large transportation infrastructure investment such as the Alaska-Canada Rail Link.

Our cursory look at the regional economic situation presented in this chapter highlights aspects of the Yukon, Alaska, and northern Canada that make the region favourable to investment in transportation infrastructure at the current time. We identified the most important of these to be:

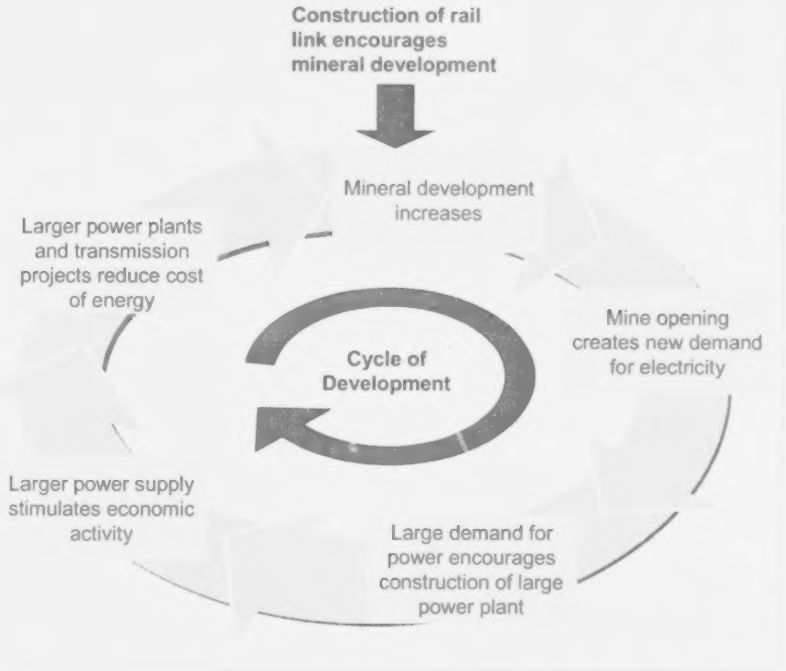
The Regional Economy is Diverse and Stable — Despite their small size, the economies of Alaska, the Yukon, and British Columbia are remarkably stable and based on a diverse set of industrial strengths. Tourism and exporting, two of the industries most likely to benefit in the short term from the Alaskan-Canada Rail Link, are both significant components of the regional economic base. Economic growth in Alaska has outpaced that of the Yukon, but this may be due in part to the greater investment that Alaska has seen in transportation infrastructure. The influx of people, jobs, and opportunities spurned by the rail link would promote economic growth in northern Canada as well as Alaska.

The Potential for Mineral Resource Development is Strong — CRA identified mineral development as the most promising opportunity likely to be encouraged by the proposed rail link. The Yukon possesses over 80 mineral deposits including large quantities of iron ore, gold, lead, zinc, nickel, copper, and tungsten. Lack of efficient transportation has been an impediment to the development of these naturally occurring resource deposits. The proposed rail link would facilitate the creation of new mines by lowering the cost of construction, thereby easing transportation of inbound products required to operate the mines, and by reducing transportation of mineral goods to deep-water ports.

3 Regional Economic Development Opportunities

The Yukon Will Be Able To Co-Develop Energy and Mineral Resources— In remote areas, energy development is co-requisite with mineral development. The Yukon has significant hydroelectric potential. The Yukon's vast coal deposits also hold enormous potential for power generation. The Bonnet Plume deposit alone could supply Canada's power needs for three to four years. This deposit could be developed independently of other minerals should infrastructure development improve access to the region. Although coal is a mineral resource, this chapter analyzes coal in the context of energy. The proposed railroad would likely facilitate a cycle of development, promoting energy sector growth through increased mineral development. See exhibit 16.

Exhibit 16. Construction of the rail link will catalyze mineral and energy development.



Construction of rail link encourages mineral development
Mineral development increases
Mine opening creates new demand for electricity
Large demand for power encourages construction of large power plant
Larger power supply stimulates economic activity
Larger power plants and transmission projects reduce cost of energy
Cycle of Development

3 Regional Economic Development Opportunities

THE CREST IRON ORE, THE BONNET PLUME COAL DEPOSIT, AND THE ALASKA-CANADA RAIL LINK COULD BE DEVELOPED SIMULTANEOUSLY.

When discussing regional development opportunities, it is important to mention that of all Yukon mineral resources, the Crest Iron ore, a 5.6 billion-tonne formation containing 46 percent iron, is by far the largest and most valuable. The close proximity of the Crest deposit to the also extensive Bonnet Plume coal is the best illustration of potential synergies in the co-development of energy and mineral resources in the Yukon. Each of these resources is sufficiently valuable in its own right that the co-development of any one is dependent on the other two. Developing only one or two of these projects risks limiting potential benefits to the Yukon, Canada, and the world.

THE REGIONAL ECONOMY IS POISED FOR DEVELOPMENT.

Economic trends in the economies bordering the proposed rail link are poised for growth. The Yukon, Alaska, and British Columbia have all become increasingly dependent on exports. Though the Yukon's economic potential is underdeveloped, there are signs the economy would respond well to new investment. The combination of economic signals suggests the proposed rail link would complement regional economic trends and enhance economic performance.

ALASKA'S ECONOMY IS WELL POSITIONED TO TAKE ADVANTAGE OF INCREASED GLOBAL CONNECTIVITY.

Alaska's economy has enjoyed steady growth for the past thirty years. Gross State Product, the value added to all goods and services produced in Alaska, has grown modestly in real terms over this period, reaching $34.2 billion in 2001 from $8.5 billion in 1977.[19] Employment has also expanded for 16 consecutive years, led by education and healthcare, new government spending, and construction.

The traditional economic base of Alaska is shrinking. The share of the Alaskan economy comprised by the oil and gas sector has declined to 45 percent of all Alaskan business creating new wealth.[20] In recent years, decreased oil production offset somewhat by the surge in price of crude oil had a negative net impact on the Alaskan economy. Reduced oil revenues lowered tax revenue and eliminated 800 high-paying jobs in 2003 alone.

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[19] Real Gross State Product in Chained 2000 dollars for Alaska obtained from Bureau of Economic Analysis Web site, http://www.bea.doc.gov/bea/regional/gsp/.

[20] Alaska Economic Performance Report 2003, State of Alaska Department of Community Economic Development, p. 2.

Weakness in the demand for Alaskan wild salmon has impacted the seafood industry. Salmon prices have been in general decline since 1993, devastating many local economies, especially in western Alaska. The private support sector, including construction, transportation, retail trade, services, and FIRE (finance, insurance, and real estate), is now the largest source of growth in Alaska.

Exports are crucial to the Alaskan economy. Alaska has one of the largest exports-per-capita of any U.S. State, with trade making up roughly 10 percent of the state GSP.[21] Japan accounts for about half of Alaska's exports, importing $1.03 billion of Alaskan products in 2003. Japan and Korea combined account for 83 percent of Alaska's seafood exports. Exports to Canada, Alaska's third largest trading partner, grew by 49 percent in 2003, led by a strong demand for Alaska's ore. Lead and zinc exports valued at $111 million represent half of the trade with Canada.[22] Belgium, China, Taiwan, and Mexico are other important trade partners for Alaska.

The economic outlook for Alaska is strong. Geographical proximity and vast natural resources position Alaska to take advantage of continued growth in the Pacific Rim countries. New export markets are emerging for Alaskan softwood species to Japan and Alaskan coal to Taiwan.[23] Traditional export markets will recover as Japan's economy emerges from stagnation. Current trends in mineral and oil exploration, tourism, and construction suggest the emergence of a diversified and growing economy.

YUKON HAS SHOWN RESILIENCE AS IT STRIVES TO FORTIFY ITS ECONOMIC BASE.

Yukon's GDP has grown modestly from 1997 through 2003. Much of its growth is in construction and retail. The expenditure on construction rose by 71 percent to $51 million in 2003 and commercial construction on the whole has grown by 200 percent. The unemployment rate fell to less than eight percent in 2004.

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[21] "Japan and Alaska: Economic Partners Across the Pacific," JETRO, 2002.

[22] Alaska Economic Performance Report 2003, State of Alaska Department of Community Economic Development, p. 44.

[23] Ibid., pp. 34-38.

3 Regional Economic Development Opportunities

The Yukon's GDP growth rate lagged Canada's growth rate in five of the last six years. Since June 1996, its economy has lost 1,900 jobs – the majority in the mining sector. Resource industries, such as mining, oil and gas, and forestry, have suffered from production decreases since 1997. Government, tourism, construction, retail trade, and wholesale trade have grown as a percentage of Yukon's GDP.[24] In particular, the public sector plays an important role in stabilizing the Yukon economy.

In 2003, Yukon was hurt by the downturn in global tourism. SARS, the War in Iraq, Air Canada filing for Companies' Creditors Arrangement Act protection, the Mad Cow disease, the BC wildfires, and a massive power outage were estimated to have cost the Canadian tourism industry two billion dollars. Tourist visits in the Yukon fell from 313,290 to 303,732 from 2002 to 2003, mostly due to a decrease in U.S. visitors. Visitors from Canada, Switzerland, U.K., Australia, and Germany increased by 6.4 percent.

Investments in the mining sector nearly doubled from 2002. The growth of commodity prices will continue to fuel financing of mining. For example, the prices of lead, zinc, and copper increased by nearly 50 percent, 20 percent, and 40 percent, respectively, from 2002 to 2003. These prices continue to grow even higher as suppliers struggle to meet the world's insatiable demand for raw materials.

In 2003, there was a soft market for timber. Low prices led to decreased production; however, prices for softwoods are forecast to increase. Moreover, new legislation that is expected to pass in 2005 will support sustained growth in the forest sector through larger, long-term tenures, pushing for development of innovative products and practises, and the development of efficient milling and processing facilities.

Yukon's economy is positioned to grow. Forecasts and trends indicate that the markets for mining commodities and construction will continue to improve. Demand and prices for Yukon's minerals are predicted to maintain their growth. The prices of softwoods are forecasted to increase and the rare combination of circumstances leading the drop in tourism is unlikely to occur again.[25]

In the Yukon's underdeveloped economy, population growth is an important economic indicator. From 1997 through 2003, Yukon's population declined by about ten percent while the Canadian population increased by five percent. The increase in jobs created by construction and retail may reverse that trend and increase immigration to the Yukon. In

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[24] Yukon Economic Development, "A New Direction: Building a Sustainable and Competitive Yukon Economy," January 2004.

[25] "Yukon Economic Outlook 2004", Yukon Economic Development, 2004.

2003, many of Yukon's communities recorded increases in their population compared to the previous year with 685 more people migrating to the Yukon in 2003. These inflows and outflows are important, yet are small on an absolute scale. Exhibit 17 shows Yukon's population has not experienced a major population increase like that of Alaska over the past century.

Canada's Commitment to Growth

In the October 2004 Speech from the Throne, the government of Canada committed to pursue a strategy to build an even more globally competitive and sustainable economy. This strategy includes investment in skilled knowledge workers, cutting-edge research, science and innovation, and helps provide an open, transparent, rules-based global trading system that would allow for the movement of goods, services, people, and technology. Also included in the federal government's strategy is a commitment to regional and sectoral development through efforts to upgrade skills, support research and development, community development, and modern infrastructure.

A strong economy, supported by a modern infrastructure, contributes to job creation and the level of income required to sustain families and their communities, while investments in key areas of social policy help to ensure that the benefits of economic growth are available to all. "[26]

CANADA AND BRITISH COLUMBIA HAVE POSITIVE GROWTH OUTLOOKS.

Canada's economy is one of the strongest and healthiest among the seven leading industrial countries (G-7), which includes the United States, Germany, Japan, France, the U.K., Canada, and Italy. However, in Canada as a whole economic growth slowed in 2003 mostly due to the depreciation of the U.S. dollar against the Canadian dollar. According to the *Year-end Review 2004,* from Statistics Canada, the 20 percent change was the largest 12-month movement of the exchange rate in Canada's history.[27]

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[26] Treasury Board of Canada, http://www.tbs-sct.gc.ca/report/govrev/04/cp-rc3_e.asp.

[27] Ibid.

3 Regional Economic Development Opportunities

Since 1998, exports of goods and services have accounted for more than 40 percent of Canada's economy—making trade a crucial part of economic activity. Openness to international trade has spurred innovation, attracted foreign investment, and created hundreds of thousands of jobs for Canadians.[28] Canada exports 86.6 percent of its commodities to the United States. Japan, the U.K., Germany, South Korea, the Netherlands, and China are other significant Canadian trading partners to which Canada exports the bulk of its goods. Agriculture, industry, and services account for 2 percent, 29 percent, and 68.6 percent, respectively, of Canada's GDP in 2003.[29]

Canada experienced slower employment growth in 2003 than in 2002. However, there was an upsurge in growth in the last four months of 2003 that ended the year with an increase in 291,000 jobs. The number of employed population relative to the working-age population rose to 62.4 percent in 2003—the highest employment rate on record. Moreover, in 2003 Canada's employment rate exceeded the United States' for the first time in two decades.[30]

British Columbia benefits from close economic ties to China.

In 2003, British Columbia, like Canada as a whole, experienced a deceleration of its GDP growth, dropping from 3.3 percent in 2002 to 2.5 percent in 2003.[31] The United States, Japan, China, and South Korea are the biggest markets for British Columbia's commodity exports. British Columbia exports 66.3 percent, 12.7 percent, 3.8 percent, and 2.9 percent, respectively—with China being British Columbia's third most important export destination. In 2003, the value of British Columbia's commodities exported to China jumped by 29 percent compared to 2002. In fact, British Columbia has surpassed Alberta as the province with the most exports to China accounting for 28 percent of all Canadian exports to China in 2003. Exhibit 18 shows export to China from all Canadian provinces in 1993 and 2003. British Columbia led Canada in job creation with a growth rate of 2.4 percent.[32]

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[28] Government of Canada, http://www.beijing.gc.ca/beijing/en/navmain/canada/economy/index.htm.

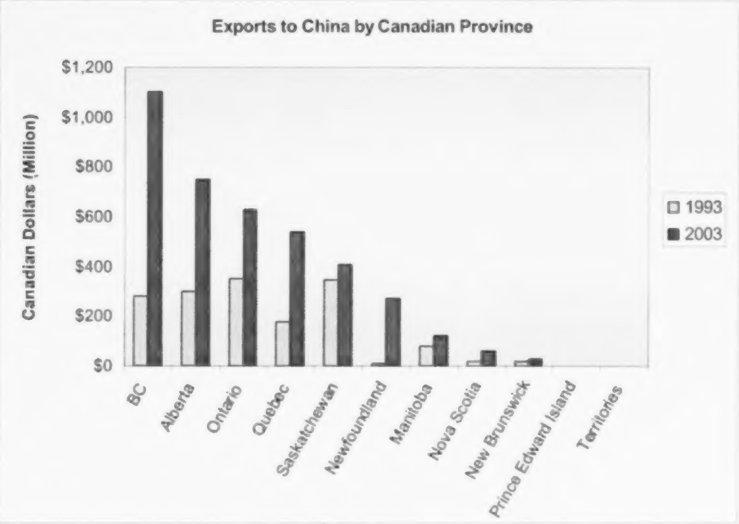
[29] http://en.wikipedia.org/wiki/Economy_of_Canada.

[30] Treasury Board of Canada, http://www.tbs-sct.gc.ca/report/govrev/04/cp-rc3_e.asp.

[31] British Columbia Government, http://www.bcstats.gov.bc.ca/data/bus_stat/bcea/tab1.htm.

[32] "BC Economic Review and Outlook" Business Council of British Columbia, November 2004.

Exhibit 18. British Columbia has become Canada's leading exporter to China.



Source: Ministry of Management Services, British Columbia, January 2004.

The future of British Columbia's exports to China is bright. British Columbia's main export is softwood lumber. New Chinese building codes introduced in November 2003 now allows wood-frame construction and should increase China's demand for lumber. Copper has been an important export for British Columbia and already enjoys a steady Chinese demand, increasing the price of copper; forecasts predict this trend will continue.[33]

Canada is in a strong position to improve growth by capitalizing on international trade. Canada believes in open trade and invests in infrastructure. China's growth and new legislation has created demand for many of the commodities that British Columbia can supply.

One challenge for British Columbia is a growing congestion in the lower part of the province. In order to alleviate this congestion problem and avoid a slowdown of its economic growth, British Columbia is investing in its infrastructure. The Ports of Vancouver and Prince Rupert are being expanded and modernized. New highways are being built, partially motivated by preparations for the upcoming 2010 Winter Olympic Games to be held in Vancouver / Whistler. CN Railway is also committed to expanding and upgrading former BC Rail trackage.

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[33] British Columbia, Ministry of Management Services, http://www.bcstats.gov.bc.ca/pubs/exp/exp0401.pdf.

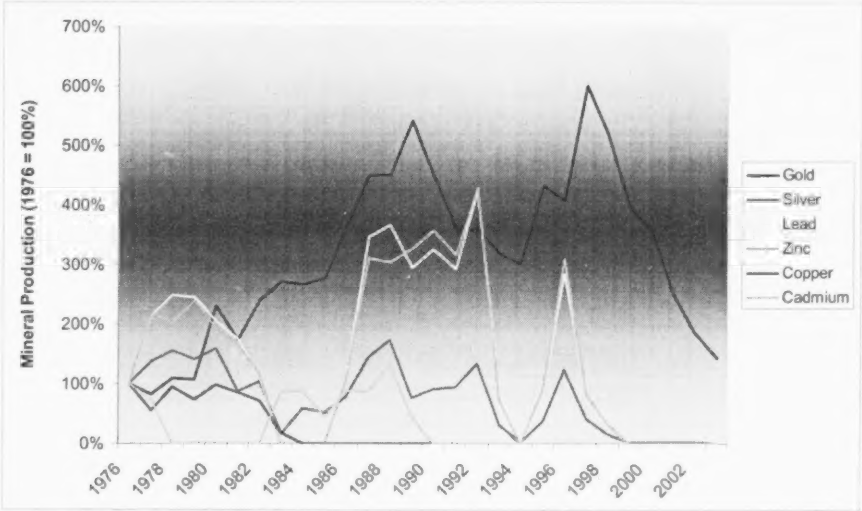
3 Regional Economic Development Opportunities

THE YUKON'S MINERAL POTENTIAL HAS NOT BEEN REALIZED.

For more than a decade, the Yukon has been experiencing a significant decline in mineral production. In 1990, mining revenue exceeded $500 million; by 2004 mining revenue had dropped by 94 percent to $30 million. This dramatic downturn can be attributed to a number of causes, the most significant of which is the downturn in prices leading to the gradual exhaustion of the economic mineralization of the Cyprus-Anvil lead-zinc-silver properties in the Faro area and the overall reduction in gold mining. In the case of Faro, the decline of the base metals markets and the development of large, low-cost base metal opportunities in Australia and other areas eventually eroded the economic position of active base metal production areas, including the Yukon. The better resources in the Faro area were being depleted as well, further compounding the problem.

Although there is currently a renewed interest in base and precious metals, this has not yet led to any new hard rock mineral production. Today, the Yukon's once prosperous metal mining industry is limited to the mining of placer gold.

Exhibit 19. Yukon mineral production leaves room for improvement.



Source: Yukon Bureau of Statistics, Yukon Government.

This decline in production has been further exacerbated by two factors. With a few exceptions such as Crest and Mactung, most of the Yukon's deposits, though significant and potentially quite valuable, are not of the world-class calibre that would normally attract international investors. Consequently the Yukon has, at least to a certain extent, been overlooked. Second, and perhaps more importantly, is the fact that the Yukon's current infrastructure is insufficient for meeting the transportation needs that a more robust development of the Yukon's mineral potential would necessitate.

Exhibit 20. Typical uses for Yukon minerals

Gold	Electronics and computer applications; aeronautics
Zinc	Corrosion resistance
Lead	Vehicle batteries; remote-access power systems; glass and plastic additives; radiation shielding; containers for radioactive materials and corrosive chemicals
Coal	Electricity generation; steel industry; non-metallic industry, including cement
Copper	Corrosion resistance; conduction of electricity; used in many alloys
Molybdenum	Strengthen steel; inhibit corrosion; used in pipelines
Nickel	Stainless and specialty steel production; plating and high-temperature alloys
Platinum/Palladium	Catalysts; electronics; jewelry
Tungsten	Cutting tools; steel fabrication; lighting filaments; electrodes, electronic contact surfaces, welding electrodes; phosphorescent pigments, X -ray screens, television picture tubes, fluorescent lighting; armour piercing ordnance and tank shielding
Barite	Paper, glass, rubber; radiology; oil well drilling
Iron Ore	Steel utilized in construction, transportation, machinery, appliances and commercial equipment

3 Regional Economic Development Opportunities

THE YUKON HAS RECENTLY FOCUSED ON EXPANDING THE EXPLORATION OF ITS MINERAL RESOURCES.

In spite of the issues mentioned above, there has been a flurry of development and exploration activity in recent years that may be the catalyst for potential development in the near future. For example, mining companies, including Yukon Zinc Corporation, have applied for licenses and are currently pursuing opportunities to develop properties in the Finlayson District in southeastern Yukon, an area of fairly intensive activity over the last few years both for smaller Canadian companies and major world mineral companies.

The Yukon Geological Survey has played a vital role in the territory's mineral exploration. Through a systematic process of identifying the mineral potential of various regions, the survey has identified 18 different deposit types and evaluated their respective potentials. Some of the most notable of these deposits include gold (epithermal, plutonic, Carlin, and quartz vein); copper (skarn and porphyry); molybdenum (porphyry); uranium (porphyry); tin and tungsten (skarns); copper-lead-zinc-silver-gold (polymetallic veins and manto, sedimentary exhalative, skarn, and volcanogenic massive sulphide); iron formation; stratiform barite; and Wernecke breccia copper-gold-iron (Olympic Dam-type).

New exploration found promising opportunities.

After consulting with Yukon Mineral Resource personnel as well as examining Natural Resources Canada data, CRA has made several preliminary observations. Clearly the Yukon Geological Survey's extensive work over the past five years, in concert with the efforts of certain junior companies and other organizations, has helped focus and assist the Yukon exploration efforts. This is particularly the case in the areas around previously delineated deposits, but also includes new exploration areas that have been discovered using new genetic modelling and improved exploration technology. Our observations include the following:

- Gold will continue to play a leading role in Yukon exploration. However, to create sufficient interest in developing a major gold mining project, it will be important to concentrate exploration efforts on deposits with medium to large reserve bases.

- Genetic modelling for Olympic Dam type mineralization could, over time, clear the way for the discovery of a major copper-gold resource. Although there have been no discoveries of this type that were of significant tonnage to date, investigations continue.

- Volcanogenic massive sulphides that have the potential for copper-zinc-silver mineralization are more likely to sustain long-term success than their lead-zinc counterparts, which historically had been successfully exploited.

- Molybdenum, copper, and gold in the southwest and west-central regions of the Yukon have major potential for a large breccia-type or porphyry-type occurrence.

- Although nickel and platinum group metals have been discovered near Kluane National Park, geologists' new understanding of the genetic models of mafic-ultramafic complexes in Canada at Voiseys Bay, Raglan, and other areas will increase the potential for delineating a significant deposit elsewhere.

- The development of major emerald and gemstone mining may stimulate additional exploration activity in surrounding areas.

- Tungsten should not be a focus of exploration as Yukon's current reserves should be economically exploitable with some infrastructure and market improvements.

CRA CONSERVATIVELY VALUES THE YUKON RESOURCE BASE IN EXCESS OF $50 BILLION.

It is always difficult to evaluate underdeveloped resources, however, the process is made somewhat easier in the Yukon because of its history of mining and extensive mineral potential. CRA has reviewed more than 80 deposit areas representative of the likely known significant projects that could come into existence over the next several decades. We concluded that 34 of these should be considered as having significant potential for future development. This does not represent the much larger Yukon resource base or even all of the Yukon reserves. It represents best judgment on development potential in the Yukon given construction of the requisite transportation and related infrastructure.

Exhibit 21. Yukon mineral reserves and resources

Metal	Number of Deposits	Million Metric Tons
Iron	1	5,600
Coal	9	757
Copper	7	266
Lead-Zinc	10	146
Gold	3	53
Nickel	1	50
Tungsten	2	34
Molybdenum	1	21
Total	34	6,928

Source: CRA estimates.

The sum of these prospects' value represents the value of the Yukon's "known" selective resource base determined by:

- The resource bases
- The grade and assumed resources
- The assumed potential mineral and metal values
- The value of metals in concentrate, or as metal, as determined by the processing method

We estimated the total mineral resource value in the Yukon to be $57 billion. This estimate was calculated utilizing the total value of reserves and resources likely to be recovered from the 34 deposits over the project's life. Certainly this value could be enhanced by expansion of reserves bases at the 34 deposit areas that are currently valued, by development of other known resources, by further downstream processing of concentrates, or by new mineral discoveries that occur with improved infrastructure.

The Yukon has mineral production potential of $2.5 billion per year.

CRA assigned an operational life to the reserve and resource base for each of the above-mentioned deposits corresponding to its size and likely level of exploitation. The annual value of deposit is based on yearly production of metal value in concentrate for base metals as determined by likely buy schedules and by the free on board (F.O.B.), or already loaded, value of mineral products. On this basis, over $ 2.5 billion per year could be produced in the Yukon if all 34 prospects were operating—although these projects will be phased in at different times.

Many of Yukon's most valuable deposits are prospects at the current time. See exhibit 22. It is likely that resources will be expanded in and around development projects. Increased production and successful exploration will lead to new mine development. The railroad route that is ultimately chosen through the Yukon, Alaska, and Northern British Columbia will have a significant effect on the specific deposits that are developed and the extent of the contribution to mineral sales value.

Exhibit 22. Many of the most valuable Yukon mineral reserves remain untouched.

		In Development		Prospect	
	Mineral Name	No. of Deposits	Total Resources (Million CD)	No. of Deposits	Total Resources (Million CD)
1	Gold	2	471	1	716
2	Zinc/Lead/Silver	1	1,062	9	4,324
3	Coal	–	–	3	16,057
4	Copper/Gold*	2	462	5	3,728
5	Molybdenum	–	–	1	420
6	Nickel/PGM's	–	–	1	1,470
7	Iron Ore	–	–	1	39,530
8	Tungsten	–	–	2	185

*Value of copper and gold in copper-gold ore.
Source: George Rainville, Associate Principal, CRA.

Major Deposits

Of the 34 deposit areas we examined in this study, there are currently seven major ones with good development potential over the next decade. CRA views these as most significant to this study. These include the seven base and precious metal deposits described below. Ancillary deposits are described in Appendix A.

Crest Property

The Crest property is part of the Snake River iron formation, which lies in a section of conglomerate, mudstone, shale, and sandstone 350 kilometres northeast of Elsa. This 5.6 billion-tonne formation contains 46 percent iron. It is owned by Chevron Resources Canada. Its remote location in the northeastern area of the Yukon is a major drawback to development, unless transport access is created.

Wolverine Property

The Wolverine deposit, located 130 air kilometres southeast of the Ross River, is a volcanogenic massive sulphide body containing an estimated total of 4.9 million tons of zinc, copper, lead, silver, and gold. Expatriate Resources Ltd. and Atna Resources own the Wolverine deposit and have one of the most advanced resource development projects in the Yukon. Annual sales of concentrate from the deposit are predicted to be on the order of $130 million. Expatriate will likely combine the development of Wolverine with its Logan deposit.

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3 Regional Economic Development Opportunities

Mount Skukum/Skukum Creek/Goddell Properties

Located 80 kilometres southwest of Whitehorse, the Mount Skukum/Skukum Creek/Goddell deposits are gold/silver properties containing quartz-carbonate, quartz-sulphide, and breccia ore, respectively. Tagish Lake Gold Corp., which owns the property and is delineating the properties' reserves on an ongoing basis, estimates the deposits' resources to be 800,000 tonnes at 6.77 grams/tonne gold and 214 grams/tonne silver as well as 320,000 tonnes at 11.02 grams/tonne gold. An additional 370,000 tonnes containing gold and silver in similar concentrates have been inferred.

Minto Property

Copper, silver, and gold are the primary commodities being produced at the Minto sulphide deposit, which is situated in a zone of foliated biotite granodiorite and quartzofeldspathic gneisses enclosed in a Klotassin granodiorite 240 kilometres northwest of Whitehorse. Minto Explorations Ltd. and Grupo Mexico SA de CV own the Minto property, with 6,510,000 tonnes of minable and 8,818,000 tonnes of geological reserves, respectively.

Carmacks Copper Property

Western Silver Corporation is in the permitting stage of its Carmacks Copper project. This oxide deposit is located 28 kilometres northwest of Carmacks and 193 kilometres north of Whitehorse. The deposit covers 232 contiguous mineral claims that are zoned mineralogically with copper oxide and copper carbonate minerals at the surface and mixed oxides and sulphides at depth. In addition to copper, silver and gold are also present in the oxide reserve estimated at 15.5 million tonnes grading 1.01 percent copper and 0.015 ounces of gold/tonne.

Ketza River Property

The Ketza property is situated 50 kilometres south of the Ross River and has sulphide and oxide reserves containing 322 quartz claims, fractions, and leases. The deposit constitutes a 230,000-tonne oxide and sulphide mineral reserve grading 10.9 grams of gold/tonne as well as potential reserves of 1,764,000 tonnes grading at 0.0915 ounces of gold/tonne. The property is owned by YGC Resources Ltd. and its mining projects are currently on hold.

Tulsequah Chief Property

Tulsequah Chief contains Kuroko-type volcanogenic massive sulphide deposits and has measured mineral reserves of 5,940,000 grading 1.42 percent copper, 1.26 percent lead, 6.72 percent zinc, 2.59 ounces of gold/tonne, and 107.41 ounces of silver/tonne. Lying 100 kilometres south of Atlin, British Columbia, the property is owned by Redfern Resources Ltd.

3 Regional Economic Development Opportunities

MINERAL DEVELOPMENT OPPORTUNITIES NEED TO BE EVALUATED IN THE CONTEXT OF GLOBAL SUPPLY AND DEMAND.

ZINC—Despite the long-awaited rise in mineral prices, the history of zinc-lead deposit values in the Yukon has been fairly lacklustre since the demise of the Faro area properties. Although there clearly continues to be a need for this commodity—production levels have increased by 26 percent over the last ten years to 91,162,000 tonnes annually—the price of zinc has remained the worst of all of the major metal commodities for several decades, with an average price over the ten-year period of 1993 to 2003 of $1105/metric tonne. CRA does not expect zinc to improve significantly in price over the long term, however we do foresee zinc becoming more attractive when mined as a co-product from deposits with a high copper content.

COPPER—The demand for copper remains robust, particularly in China, Japan, and the developing world as well as the United States, Germany and the other developed nations. Despite numerous major developments in recent years as a result of closure, exhaustion, and grade declines that have kept demand in step with development. The long-term outlook for copper is good, but prices will be below current price levels. In the Yukon, focusing on copper-molybdenum, copper-gold, or copper-zinc will likely prove to be a prudent strategy.

GOLD—Gold prices will most likely remain at levels conducive to the exploitation of deposits with combined operating and capital recovery costs of $300 to $350 per ounce. There are many potential targets in the Yukon that would likely meet these requirements.

COAL—There is no indication based upon a preliminary assessment of current resources that any of the Yukon's coal deposits are more than marginally economic, despite their near-term, high price levels, without a significant transport infrastructure. The Bonnet Plume Basin is the largest and most attractive resource.

TUNGSTEN—There are deposits of tungsten available for development should the market ever warrant it; however, Yukon deposits are not of as high grade as those currently being exploited.

LEAD—Despite its current high price, it is unlikely that primarily secondary supplies will be able to meet increases in demand for lead. Secondary lead, however, will become even more important as developing countries develop better battery recycling operations.

MOLYBDENUM—Molybdenum is likely to grow over the long term, although prices will decline significantly from their current to more historic levels.

IRON ORE—High demand and continued industry consolidation have helped solidify prices. There is a good long-term outlook, particularly in Asia.

PLATINUM GROUP METALS (PGMS)—These precious metals present good long-term opportunities.

NICKEL—Growth in stainless steels, along with battery applications should ensure continued growth.

LACK OF TRANSPORTATION CURTAILS DEVELOPMENT OF MINING OPERATIONS.

The relatively low price to weight ratio of minerals necessitates efficient transportation. A typical base metal mine may yield between 50 and 100 thousand tonnes of contained metal in concentrate per year. The cost of operation of a mine and a processing plant is in the range of $30 to $150 million per year.

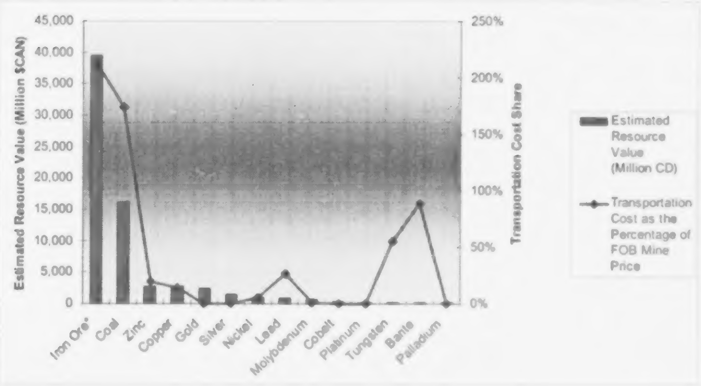
Exhibit 23. The capital and operations costs of a typical mine and mill

Annual capital and operating costs (000,000)	**Mine**	**Mineral Processing Plant**
Capital Recovery	***$20***	***$30***
Operating Costs	***$27***	***$32***
Labour	$10.08	$9.00
Maintenance	$6.84	$2.16
Energy	$5.04	$8.28
Supplies	$3.24	$11.88
General Operations	$1.80	$1.08
Total Operating Costs and Capital Recovery	***$47***	***$62***

Notes:
1. Cost estimates based on open pit hard rock mining; 3.6 million tonnes of ore and 1.8 million tonnes of waste.
2. Capital expenditures exclude cost of infrastructure external to mine or refinery.
3. Yearly capital expenditures based on 10 years of operation.

The transport of base metal concentrates can add up to 20% to 25% to the contained metal cost when overland and ocean transport to the smelter/refinery is included. This means that once the ore is extracted and processed, moving it to market may cost between twenty and fifty dollars per tonne. These are rough estimates and will vary widely by the location, product type, and other characteristics of the mine. Base metal concentrate transport costs, never the less pale in comparison to transport costs for lower valued products such as iron ore and coal, which may be double the F.O.B. price of the product. Exhibit 24 shows that for iron ore, transportation costs can be up to double the F.O.B. mine price that would be paid for the minerals fully loaded for shipment at the mine.

Exhibit 25. Yukon's most valuable mineral resources are costly to transport.



*Concentrate

Source: CRA estimate of transport cost as a percentage of value of concentrate or final product (depending on level of processing) of material transported from the Yukon by rail to port in Canada and subsequently shipped to Asia. Rail and ocean costs are approximately equal.

3 Regional Economic Development Opportunities

Transportation is crucial for the entire spectrum of mineral exploration, development, and production. Mining is a transportation intensive business, especially in areas as geographically remote as much of the Yukon. Large amounts of equipment and materials must be transported to a site just to begin operations. The on-going mining process requires additional inbound materials and supplies. Mined minerals need to be moved from the mine to processing plants, and from there to the ultimate consumers of the products. Transportation is particularly important to the Yukon because of the immense distances between mineral resources and shipping access routes. The proposed Alaska-Canada Rail Link will facilitate natural resource development by lowering the cost of transportation in several key arenas:

- Movement of equipment for exploration efforts
- Movement of ore for bulk testing to support mine feasibility studies
- Movement of material required for new mine development
- Movement of material required for ore processing plants
- Continued movement of supplies required to support continued mining operations
- Transportation of outbound mineral concentrate or metals
- Supplies to support personnel and local towns
- Development of power generation to operate the mines and mineral processing facilities

The following exhibits describe the typical types and volumes of freight that are required to open and support modern mining operations. This represents a small- to medium-size mine that would be typical of the Yukon. The major coal, iron ore, and base metal deposits would require significantly more mining and processing equipment.

Exhibit 26. Heavy machinery required to develop a typical mine

Major Mine Equipment	Quantity
K-80 trucks	6
Cat-140 motor graders	2
Komatsu dozers	2
T-5 rotary blasthole drill	1
RH-75 shovel	1
Cat 992-C wheel loader	1
Cat-824 rubber - tired dozer	1

Source: Based on CRA estimates assuming open pit hard rock mining of ore and waste of 5.4 million tonnes/year at a milling rate of 3.6 million tonnes.

Exhibit 27. Heavy machinery required to develop a typical ore processing plant.

Major Mill Equipment	Quantity
ATM - type apron feeder	1
Disc classifier	1
1 x 2 meter jaw crusher	1
28 ft diametre x 14 ft EGL semi-autogenous mill	1
300 ft diametre Eimco thickener	1
Agitated surge tanks	2
0.5 in. - thick x 6 km, 10.75 in. - unlined steel pipeline	1
Ceramic choke stations	2
1000 ft3 rougher flotation cells	11
9.5 x 12 regrind mill	1
1 m3 cleaner, recleaner, and scavenger cells	60
9 8 ft disc filters	2
5 x 20 ft oil - fired rotary dryer	1
275 ft diametre tailings thickener	1

Source: Based on CRA estimates assuming open pit hard rock mining of ore and waste of 5.4 million tonnes/year at a milling rate of 3.6 million tonnes.

Exhibit 28. Supplies and Energy for a typical mine exceed six million dollars per year.

Mine	Basis	Unit	Quantity/yr	Unit Cost	Total Cost (000,000)
Supplies					4.28
Tires					0.66
Explosives	0.3 kg per tonne of rock	kg	1,620,000	0.25	0.49
General Operating	$0.10 per tonne of rock				0.65
Maintenance	Replacement parts,steel,etc.				2.48
Energy					1.79
Electricity		000 kWh	9,000	30	0.32
Fuel		000 Gal	940	1.3	1.47
Natural Gas					0.00
Coal					0.00
Total Supplies and Energy					**6.07**

Note: Based on CRA estimates of a typical Canadian mine assuming open pit hard rock mining of ore and waste of 5.4 million tonnes/year at a milling rate of 3.6 million tonnes.

Exhibit 29. Supplies and Energy for a typical ore processing plant are over eight million dollars per year.

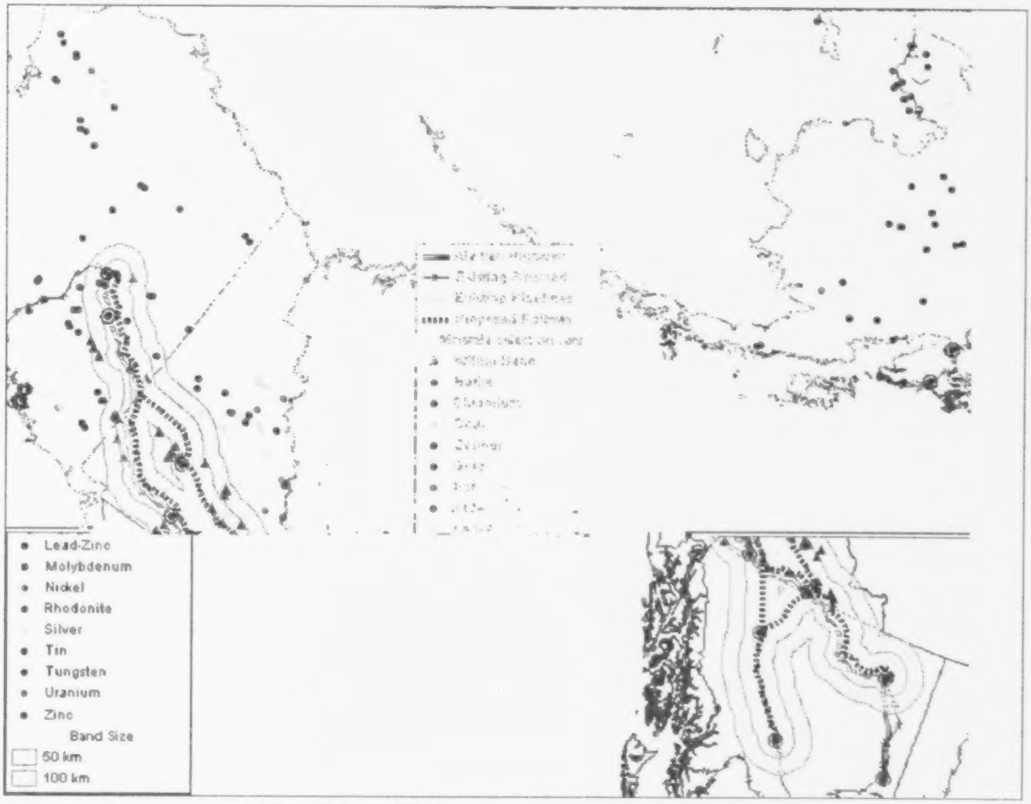
Mineral Processing Plant	Basis	Unit	Quantity/yr	Unit Cost	Total Cost (000,000)
Supplies					5.57
Grinding Media	0.6 kg per tonne of ore	kg	2,160,000	0.68	1.76
Reagents			1		0.96
General Operations	$0.1 per tonne of ore				0.43
Liners	0.18 kg per tonne of ore	kg	648,000	2.1	1.63
General Maintenance	$0.18 per tonne of ore		1		0.78
Energy					3.00
Electricity		000 kWh	76,000	30	2.74
Fuel	Minor	000 Gal			0.00
Natural Gas	$0.06 per tonne of ore				0.26
Coal					0.00
Total Supplies and Energy					**8.57**

Notes: Based on CRA estimates of a typical Canadian mineral processing plant assuming open pit hard rock mining of ore and waste of 5.4 million tonnes/year at a milling rate of 3.6 million tonnes.

3 Regional Economic Development Opportunities

THE RAILROAD WOULD CHANGE THE ECONOMICS OF MINERAL DEVELOPMENT BY LOWERING THE COST OF OPENING MINES AND SHIPPING MINERAL DEPOSITS.

Exhibit 30. The proposed railway would access multiple mineral deposits.



Existing Railroad
Existing Pipelines
Proposed Railway
Mineral Locations
Lead-Zinc
Molybdenum
Nickel
Rhodonite
Silver
Tin
Tungsten
Uranium
Zinc
Band Size
50 km
100 km

Sources: 1. Report on Survey Trans-Canadian Alaska Railway Location, 1942 U.S. Army Corps of Engineers.
2. The Alaska – Canada Railroad Corridor Feasibility Study, Canadian Arctic Railway Company, 2004.
3. Overview, 2003. Yukon Geological Survey. Yukon Mining, Development and Exploration.
4. Alaska Mineral Locations Database, Interagency Minerals Coordinating Group.

The Alaska-Canada Rail Link would have a profound impact on the mineral industry in the Yukon. Though mineral production has declined significantly over the last few decades, the Yukon possesses valuable reserves and resources, which would benefit from efficient transportation to likely markets.

3 Regional Economic Development Opportunities

ENERGY PRODUCTION AND TRANSMISSION

YUKON DEPENDS PRIMARILY ON IMPORTED PETROLEUM PRODUCTS FOR ENERGY.

The Yukon depends on imported fossil fuels for three quarters of its energy needs. Yukon residents and officials are conscious of the outflow of Canadian dollars required to purchase and transport energy. Yukon residents pay on average 41.8 percent more for energy while consuming 19.2 percent less energy than those living elsewhere in Canada.[34] The Energy Consumer Price Index of Whitehorse was significantly higher than the national average in 2000, 142.2 v. 132.3.[35]

The Yukon Energy Corporation has made an effort to decrease dependency on fossil fuels by promoting hydroelectric, wind, and other renewable resources. Currently, 95 percent of electricity in the Yukon is hydroelectric.[36] The Yukon Energy Corporation recently completed a transmission line connecting Mayo hydroelectric facility to Dawson City and studied the feasibility of a wire from Carmacks to Stewart Crossing connecting the northern and southern hydroelectric grids into a single network. Yukon has two large wind-powered turbines in Haeckel Hill and in 2003 hosted the Yukon International Wind Energy Conference. Few regions of the Yukon currently rely on diesel fuel. The Yukon's remaining 19 diesel generators are primarily for emergency backup.[37]

MINING AND OTHER INFRASTRUCTURE DEVELOPMENT IN THE YUKON WILL INCREASE DEMAND FOR ADDITIONAL ENERGY RESOURCES IN THE YUKON AND ALASKA.

Developing mines to access the Yukon's rich resources will require power to crush and grind ore. Underground mines will consume energy in hoisting and ventilation. Mining operations require two to thirty megawatts per year depending on size, depth, extraction method, and ore density. Diesel typically powers mining operations because other sources are inaccessible in remote areas.

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[34] Based on 1999 data, Statistics Canada, catalogue no. 57-202.

[35] Statistics Canada CANSIM II, Table no. 326-0002.

[36] Yukon Government: Energy, Mining, and Resource Development.

[37] Yukon Energy Corporation 2002 Annual Report.

Mines often deplete in short time spans increasing the financial risk of long-term investments in hydroelectric facilities and transmission lines. The Faro mine located northeast of Whitehorse, once the world's sixth largest zinc producer producing at rates up to 14,000 tonnes per day[38], consumed an average of 20 megawatts during its operation, or 160 Gigawatt-hours per year. Half of Faro's power was supplied by hydroelectric power and the other half was supplied by diesel generation.

The Yukon's current transmission system would support limited mineral development. Large mining operations in the Tintina Trench region may require the upgrading of both the 69 KV transmission line from Mayo to Dawson as well as the Whitehorse grid system.

DEVELOPMENT OF NATURAL ENERGY OCCURRENCES IN THE YUKON COULD HELP MEET INCREASED ENERGY DEMAND WHILE DIMINISHING THE YUKON'S DEPENDENCE ON IMPORTED FOSSIL FUELS.

In this section, we examine the importance of the proposed rail line to the energy sector. The lack of rail infrastructure has discouraged the exploitation of coal resources. Consequently, oil, natural gas, and hydroelectric generation are currently Yukon's most important sources of energy. We offer a limited review of non-coal energy sources in that oil, gas, and hydroelectric do not represent a potential freight source for the proposed rail line. We do describe how the proposed rail line will decrease the cost of grid construction, which could be utilized by any generating plant and power source. The new rail line will also encourage the development of coal resources, the single most important commodity and source of freight revenue on the balance of the North American rail system.

Oil and gas are important sources of energy for the Yukon. The Kotaneelee facility in southeastern Yukon produces approximately 14 billion cubic feet of natural gas per year. Development of the Yukon's eight known petroleum basins will likely accelerate in coming years due to pipeline investment and government initiatives promoting a competitive oil and gas regime.[39]

Hydroelectric power generation is also an important source of Yukon energy. High water levels increase hydropower production capacity in summer months when Yukon's power consumption is low. Several proposals have put forth ideas for storing surplus energy in the form of batteries, wood pellets, and even fertilizer. Canadian policy makers have discussed a high-tension transmission line for shipping surplus electricity to southern markets in the summer and importing electricity to meet Yukon's demand for heating in the winter. The project's relatively high price tag is estimated at $1.5 billion limiting the likelihood of implementation in the short-term.

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[38] "Yukon's Mining History", Government of Yukon Web site, http://www.emr.gov.yk.ca/Mining/ExplorationAndIndustryInformation/MiningHistory/YukonMiningHistory.htm.

[39] *Yukon Oil and Gas: A Northern Investment Opportunity 2004*, Yukon Government.

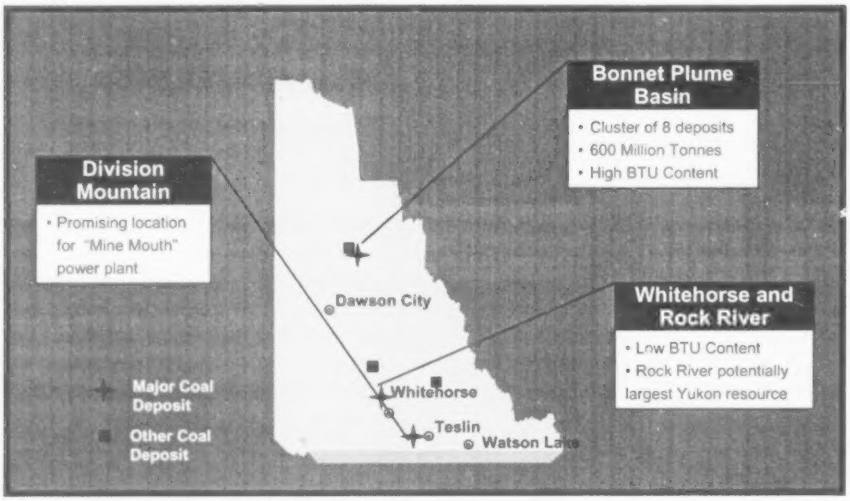
Importance of Coal

Production and transportation of fuel is on the order of 500 kilograms of coal and 10 barrels of oil per person per year; this exceeds agricultural production, but is considerably easier to manage as freight, because production and consumption are highly concentrated. Coal is the most important commodity shipped by railroads, usually transported directly from mines to power plants and large industrial users. The major producers are China and the United States, with substantial production in India, Australia, Russia, South Africa, and Poland. In addition to being the single largest commodity transported in North America, coal is also estimated to be one of the most profitable commodities shipped on the North American railroads. It is a major export commodity as well. Advances in rail and ocean transport allow worldwide distribution.

Coal may lead future energy growth in the Yukon and Alaska. Alaska already produces coal, providing 1.5 million tonnes per year from the Usibelli mine alone. Alaska exports half its coal to Asia and consumes the remainder in four power facilities located along the proposed rail link, each with an installed capacity of 244 Megawatts. Known reserves in Alaska are 1.7 billion tonnes concentrated in Usibelli and Cook Inlet-Susitna Basin. Alaska possesses an estimated 155 billion tonnes in coal prospects, including large deposits at Beluga, Wishbone Hill, Chuitna, and Deadfall Syncline. Remoteness and low power efficiency are major challenges to development of coal resources in Alaska.

The Yukon has 800 million tonnes of identified deposits. The most valuable of these are the Bonnet Plume Basin (660 million tonnes), Rock River (60 million tonnes), Whitehorse (26 million tonnes), and Division Mountain (45 million tonnes). Bonnet Plume Basin's low sulphur content, thick seam, and power factor of 9,700 BTU/lb make this mine the most attractive coal prospect in the Yukon. The Division Mountain because of its close proximity to the proposed railway may be an ideal site for a "mine-mouth" coal plant with production potential of 200 megawatts per day.

Exhibit 31. The Yukon has promising coal resources.


Bonnet Plume Basin
• Cluster of 8 deposits
• 600 Million Tonnes
• High BTU Content
Division Mountain
• Promising location for "Mine Mouth" power plant
Whitehorse and Rock River
• Low BTU Content
• Rock River potentially largest Yukon resource
Dawson City
Whitehorse
Teslin
Watson La
Major Coal Deposit
Other Coal Deposit

Source: *Yukon Mineral Deposits*, Jan. 2004, Yukon Geological Survey.

THE PROPOSED RAILROAD COULD EXPEDITE GRID EVOLUTION IN ALASKA AND YUKON.

Power production and transmission in sparsely populated regions typically develops in a slow gradual process. Small settlements subsist on local power supplies. Large development projects, such as mining operations, roads, pipelines, and railways encourage centralization of the population, eventually leading to the creation of medium-sized power plants. Increased capacity of larger power plants encourages development of industrial and commercial operations in the surrounding region. Demand may then increase to a level warranting a large power plant supported by a high-tension transmission line. The time required to move from small local power supplies to large-scale energy production and transmission can range from a few years to decades.

The rail link will likely expedite grid evolution by boosting both energy supply and demand. Improved infrastructure will encourage development of the Yukon's petroleum and coal energy resources. Construction of the rail link will draw workers and machinery into the Yukon creating centralization of demand. Once completed, the railroad will encourage development of new mines putting a strain on existing power infrastructure and encouraging new investment.

The proposed rail link will also reduce the cost of building the energy grid by building a foundation of skilled labour, by decreasing access costs for construction equipment and materials, and by covering the fixed costs of surveying, clearing, and grading the right-of-way. With adequate planning and coordination, power corridors and the proposed railway can co-

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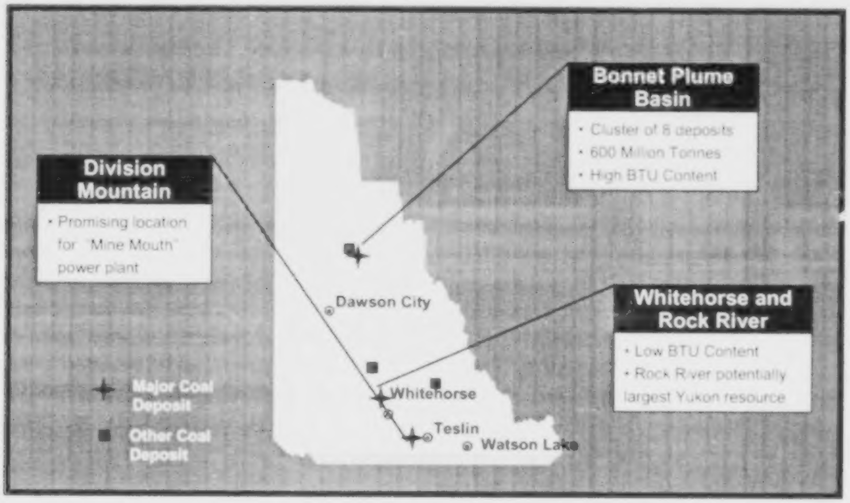
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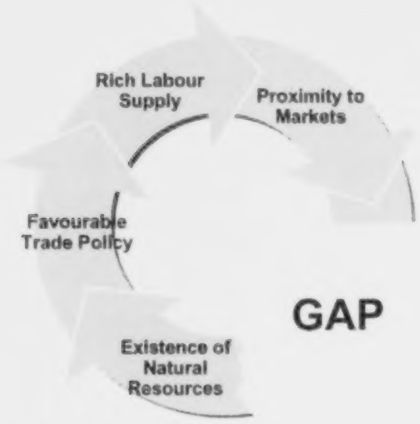
SUMMARY

The analysis contained in this chapter suggests the economies of Alaska, Yukon, and northern Canada would benefit greatly from the proposed rail link. Both the minerals and energy sectors are most likely to experience immediate growth when the railway is built, yet there are several others that will benefit, such as tourism, exporting, forestry, and fisheries.

The regional economy, though small, is sufficiently diverse and stable to sustain a large infrastructure investment. The region's ability to make full use of future connectivity lies not in its current economic performance, but in its vast natural resources. Those resources, while unconnected to efficient transportation, will remain undeveloped.

Exhibit 32. Limited transportation infrastructure impedes the evolution of resource development in the Yukon



Lack of transportation infrastructure will impede mineral development...

..leaving natural resources unconnected to where they are needed most.

Without investment in transportation the Yukon's resource potential may remain unrealized.

4 Implications for Infrastructure Demand

What Does "Freight Mobility" Mean?

- Manufacturers' ability to obtain raw materials from distant sources.
- A city's ability to obtain food, energy, construction materials, and other goods at costs that do not discourage development and growth.
- The ability for manufacturers to consolidate production so as to achieve economies of scale and sell to a larger market.
- The ability to achieve lower density within metropolitan areas because it is easy to transport goods within the region while the metropolitan areas themselves grow.
- Individuals' ability to obtain groceries, energy, and other goods without increased costs, disruptions in service, or greater expenditures of time.
- Producers and individuals being able to send and receive packages or other shipments of many different sizes without excessive cost or time.

INTRODUCTION

Recently, two seminal studies have been published that examine the expected growth in transportation demand and the potential effects of that growth on infrastructure congestion, shipment costs, and economic development. This chapter summarizes findings from the AASHTO Freight Rail Bottom Line Report and the World Business Council for Sustainable Mobility Report. Both of these studies highlight the critical nature of an impending congestion crisis. We also will review issues with the various modes of transportation around the world and explore how those specific modal issues reinforce the need to better understand the feasibility of the Alaska-Canada Rail Link.

Businesses and governments around the world are concerned about congestion.

AASHTO, a consortium of all 50 State Departments of Transportation (DOT's), alarmed by the potential impact that the doubling of transportation demand may have on the U.S. highway network, commissioned a report to explore the level of public spending that would be required to strengthen and expand the U.S. railway system to accommodate the expected increase in freight volumes. In its "Bottom Line Report", AASHTO assumes current modal splits and growth trends and projects that, "By 2020, the highway system must carry an additional 6,600 million tons of freight (an increase of 62 percent), and the freight rail system must carry an additional 888 million tons (an increase of 44 percent). However, the highway system is increasingly congested, and the social, economic, and environmental costs of adding new highway capacity are prohibitively high in many areas. State departments of transportation are asking if expanding the capacity of the freight-rail system in some cases might be a cost-effective way of increasing the capacity of the total transportation system."[40]

The existing transportation infrastructure and systems will not be able to handle the expected growth. Worldwide mobility is in jeopardy. Our ability to freely travel and to ship goods will significantly deteriorate as portions of the transportation network become congested and eventually reach gridlock. Competition for the limited supply of transportation capacity will drive up the cost of shipping goods. And, because of the congestion, shippers will be paying higher prices for significantly slower and less reliable service than they historically enjoyed. A group of business leaders representing some of the world's largest companies wanted to better understand how changes in mobility will affect companies' ability to function in the future. Under the auspices of the World Business Council for Sustainable Mobility, these industrialists commissioned Charles River Associates to prepare a detailed study of the current and projected status of mobility around the globe and the expected impact of impending congestion on the sustainable health of the world economy.

AASHTO highlights the effectiveness of Railways in facilitating cross-border trade.

By serving the nation's seaports, rail becomes a critical element in the nation's access to global markets, and supports U.S. producers and consumers in the world economy. Rail also provides access across land borders to Canada and Mexico. While trucks sit in queues at borders awaiting inspection and clearance, trains that are pre-cleared and electronically tracked can cross the border at full speed without stopping. According to the U.S. Bureau of Transportation Statistics, surface trade with Canada and Mexico was valued at over $575 billion dollars in 2000. Rail was responsible for over $94 billion dollars or 16 percent of this trade. Just five border crossings—Port Huron, Michigan; Laredo, Texas; Buffalo-Niagara Falls, New York; Detroit, Michigan; and International Falls-Ranier, Minnesota—account for 80 percent of rail-borne international trade by value.[1]

These two studies are indicative of the relatively high level of attention that governments and business leaders around the world are currently giving to transportation access and mobility issues. A detailed feasibility study of the proposed Canada-Alaska rail link would be a timely addition to the current body of research activity focussed on developing solutions to soften the global economic impact of higher transport costs that will result from congestion and decreased transport mobility.

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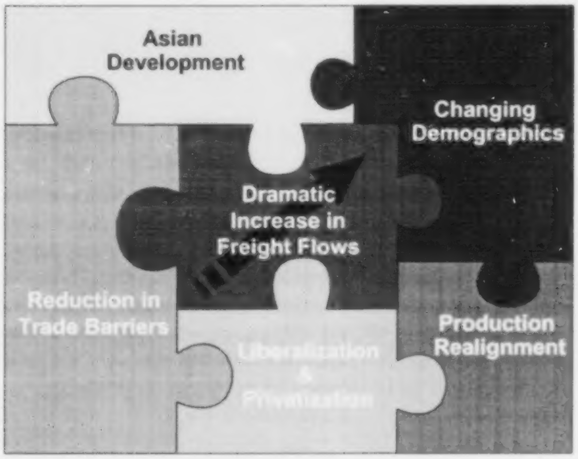
[40] AASHTO Bottom Line Report Page, p. 2.

4 Implications for Infrastructure Demand

GLOBAL FREIGHT FLOWS ARE GROWING.

The rapidly expanding world economy coupled with a dramatic realignment and consolidation of production centers towards Asia has created a significant demand for raw materials to be shipped from Africa, Siberia, Australia, and the Americas. Indeed, as nations implement free trade agreements, liberalisation, and free markets, the expected growth in the demand for transportation is expected to outpace the total growth of the economy by several magnitudes. Exhibit 33 depicts the multiple forces underlying the increase in freight flows. Economists in the U.S. predict that a three percent per year growth in the national economy will increase the demand for domestic freight transportation by 57 percent by 2020 and import-export tonnage will increase by nearly 100 percent during that same period.[41]

Exhibit 33. Multiple factors have combined to increase the global freight flows.


Asian Development
Changing Demographics
Dramatic Increase in Freight Flows
Reduction in Trade Barriers
Liberalization & Privatization
Production Realignment

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[41] Ibid., p. 2.

4 Implications for Infrastructure Demand

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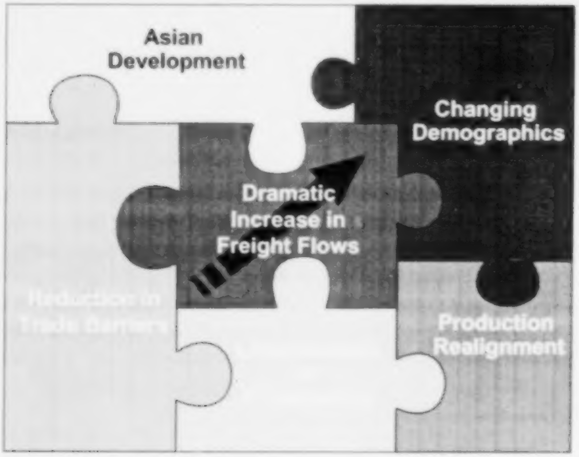
Asian Development
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[41] Ibid., p. 2.

4 Implications for Infrastructure Demand

Regional Freight Movements

Freight mobility is absolutely essential to the modern world. The ability to transport large volumes of goods long distances at very low costs enables cities to exist, farmers to find markets for their crops, firms to reap the advantages of specialized production, and consumers to have access to a vast variety of goods at affordable prices. The importance of freight mobility is not confined to the long-distance movement of goods. The efficient movement of freight within an urban area, or over regional distances (100–500 kilometres) is a key to competitiveness.

Regions are areas that may include a dominant city, several other cities, numerous smaller cities and towns, and a rural hinterland. The distances involved in regional freight movements are in the 100- to-500-kilometre range. Regions are best defined in terms of economic geography, which seldom follows political borders. An appropriate region might be a state or a province within a large country, an entire country, or several small countries.

At the regional level, moving food and other essentials directly to or from households and small businesses is no longer a prime concern. Instead, the issue is moving goods to, from, and between production facilities, warehouses, storage facilities, and regional connections to the national and international networks.

National or Continental Freight Movements

There are two strategic freight-related concerns at the national level, where the distances are in excess of 500 kilometres. The first is the ability to move goods throughout the country or continent at low cost, so as to allow economies of scale in production and distribution. The second is the ability to serve export and import markets. Lower transport costs allow a country to compete in international markets for a broader variety of goods.

As distances get longer, the cost advantage of rail becomes more attractive. Railroads are well suited to hauling large shipments of coal, grain, and other bulk commodities. For container traffic, the line-haul cost savings on the railroad become enough to offset the costs of moving trailers or containers on or off rail cars. As a result, intermodal transportation linking rail and truck becomes an option.

International Freight Movements

Ocean shipping is the dominant mode for overseas freight tonnage. Ocean shipping is highly efficient. Extremely large ships, operated with remarkably small crews, move great tonnages vast distances at minimal costs. Competition is fierce, keeping prices low and encouraging international trade. While almost any commodity can and does move in ocean shipping, three dominate: oil, grain, and containers.

4 Implications for Infrastructure Demand

TRANSPORTATION CAPACITY IS LIMITED AND CONGESTION IS GROWING.

The predominant modes of freight transportation are railways, highways, waterways, and pipelines. In the following sections, we examine the current status of each mode and highlight trends that are contributing to capacity shortages. Many of the examples and cases that are discussed are U.S. focussed largely because transportation congestion problems and infrastructure issues are much more severe in the United States than in Canada. This situation presents an opportunity for Canada to develop alternative transportation capacity that will serve all of North America and help address the impending crisis in the United States.

North American railways are carrying historically high volumes of freight on fewer track miles of infrastructure.

In the United States, the freight-rail system carries 16 percent of the nation's freight by tonnage, accounting for 28 percent of total tonne-miles, 40 percent of intercity tonne-miles, and six percent of freight value.[42] At the same time as rail volumes are increasing, railway companies continue to struggle to earn their cost of capital, a key financial hurdle set by the investment markets. Companies that do not earn cost of capital must shrink their capital stocks to the point where earnings can sustain the smaller asset base. Railway companies are no exception and have continued to rationalize excess track networks and reduce the number of yards and miles of mainline. Some of this rationalization was enabled by productivity improvements resulting from high technology dispatch systems, newer materials, stronger and more efficient track structures, and innovative rail car designs such as double stack intermodal equipment and heavy-axle aluminium-bodied coal cars.[43]

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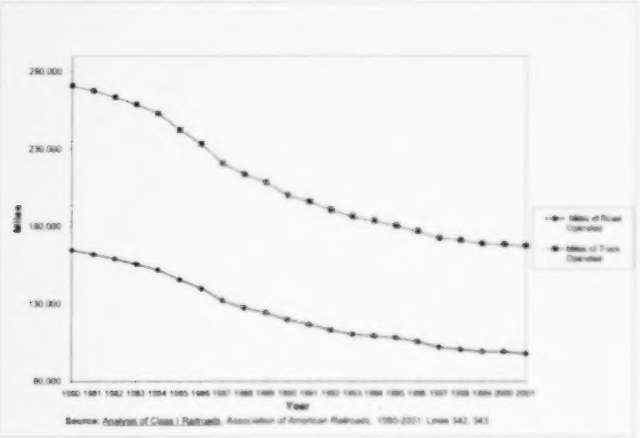
[42] Ibid., p. 2.

[43] Expert Testimony of George Eads, Vice President, CRA. National Carriers Conference Committee, January 2003.

Exhibit 34. Class I railroad miles of track and route operated are declining.



Source: Analysis of Class I Railroads, Association of American Railroads, 1980-2001 Lines 342, 343

However, over the last several years, as rail volumes increase, many parts of the rail system are reaching capacity. Congestion at these key bottlenecks has caused a number of notable breakdowns in rail service. In 1996, the Houston region of the U.S. became gridlocked and problems rippled across the entire North American system as trains could not get in or out of terminals due to the congestion. During the 1999 merger of Conrail, the Norfolk Southern had difficulty integrating the information technology systems of the two companies. As a result, NS traffic was delayed and shippers diverted large volumes of freight onto the competing CSX systems, in turn creating congestion and service problems on the CSX. Most recently, the Union Pacific Railroad underforecasted the volume of freight on its Los Angeles to Las Vegas route and did not have enough crews hired and trained to absorb all of the demand. The excess traffic queued up at either end of this corridor, creating congestion and causing re-routes as traffic was diverted away from the problem area.

The North American rail network is an interdependent web of lines such that problems in one part of the network can spill over and impact service on previously fluid parts. Each terminal is dependant on inbound trains as sources for empty cars, locomotives, and crews needed to service originating freight at that terminal. If the inbound flows are delayed or cut-off as a result of congestion, a once fluid terminal begins to accumulate cars it cannot move out, and local shippers experience spot-shortages of empty cars needed for outbound loading.

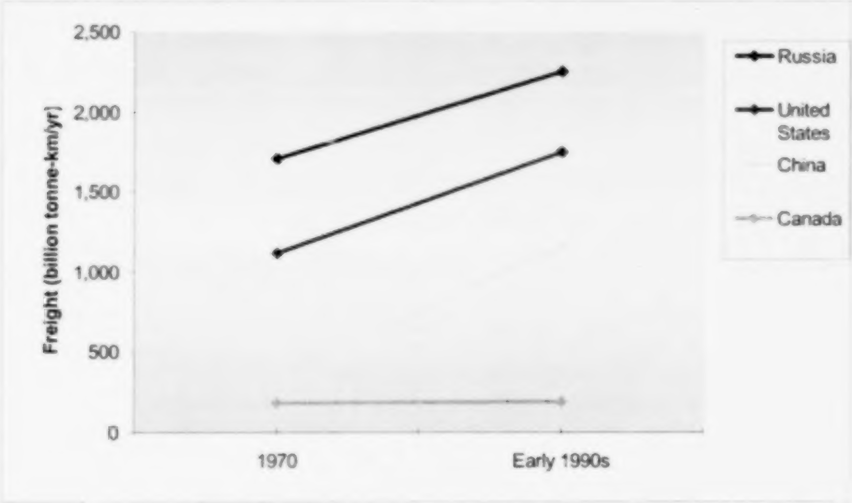
Companies have been experimenting with moving freight from Western Canada destined to points in the eastern United States via Pacific seaports. The freight is trans-loaded unto vessels to avoid delays associated with lack of railcars, inconsistent transit times, and inordinate delays at major rail hubs.

Canadian Railways are not immune to the growing railway congestion problem.

West Fraser Timber Co. said in April it will send wood products on a 6,000-mile (9,654-kilometre) sea voyage via the Panama Canal to avoid rail bottlenecks. Union Pacific Corp. and other North American railroads have more business than they can handle because of rising demand to carry products to market. If the railways were as efficient as they were two years ago we wouldn't be shipping like this by sea," Bill LeGrow, West Fraser's vice-president of transportation and energy, said in a telephone interview. "The problem with the U.S. railways is the service has deteriorated so much."

Rail shipments to the East Coast from B.C. that used to take 18 days now take more than a month, LeGrow said. A comparable sea voyage takes about three weeks, excluding as much as three weeks to accumulate cargo at the British Columbia port before setting sail and the delays caused by unloading at more than one East Coast port, he said.[44]

Exhibit 35. Canada has not enjoyed the increase in rail freight volumes experienced in other large geographical countries.



Source: *Transportation Statistics Annual Report 1997: Mobility and Access*, pp. 250-5; US DOT, Bureau of Transportation Statistics.
Note: Early 1990s – varies by country (1991, 1993 or 1994)

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[44] The Vancouver Sun (British Columbia), Business BC; p. G2 "Canfor shuns rail for sea shipments: Vancouver lumber producer follows rival West Fraser away from North America's railway bottlenecks," Christopher Donville, July 24, 2004.

4 Implications for Infrastructure Demand

Highways are congested; fuel prices and driver shortages constrain truck capacity.

The North American highway system is marked by severe and growing congestion problems especially in urban areas. Even the intercity freeways are becoming congested. America continues to build and upgrade highways at an astounding rate with annual federal highway expenditures in excess of $300 billion. In the next few years, a major widening project of Interstate 95 from Washington D.C. to Miami will be completed, creating a six lane highway that connects the entire Eastern seaboard. However, while these expansion projects slow the rate of growth of congestion, experts agree that it will be impossible to build our way out of the impending congestion crisis. Congestion slows average truck velocity, in turn deteriorating fuel efficiency, asset utilization, and trip miles per driver month. Trucking companies will face an ever-increasing cost function as congested areas become more prevalent and today's temporal rush hours turn into never-ending traffic jams.

Fuel is a relatively much higher percent of a truck's variable cost than that of railways. Consequently, as fuel prices go up, trucks become less cost competitive vis-à-vis rail. During periods of high fuel prices, many shippers use rail rather than pay premium prices for truck service. As demand for truck transportation diminishes, marginal carriers and smaller operators are forced out of the market. Either long periods of relatively high fuel prices or long periods of wildly fluctuating fuel prices will tend to reduce the viability of marginal truck companies and favour a diversion of freight to railways.

Finally, there is a severe truck driver shortage in North America. This phenomenon is part of a larger problem with the shrinking semi-skilled labour force. One transportation official recently lamented that it is nigh onto impossible to find people that can read and write at the sixth grade level and pass a drug test. Truck drivers must be formally trained, qualify for a national drivers' license, work long and irregular hours, and often are away-from-home for weeks at a time. It is common for even the large, premium, unionized carriers with relatively high wages to experience annual turnover rates for drivers in excess of 80 percent. The lifestyle of truck drivers and the general lack of semi-skilled labourers are raising the cost of trucking in North America and contributing to a tightening of highway based transportation capacity. J.B. Hunt recently announced a 15 percent wage increase for drivers to stem turnover and attract new employees.

4 Implications for Infrastructure Demand

The maritime industry is suffering from a shortage of ships exacerbated by port congestion.

Port congestion is becoming a real problem, especially in the largest West Coast ports of Vancouver, Long Beach, and San Francisco. Shipping companies are seeking ways to bypass the largest ports and utilize relatively smaller and free-flowing ports. Many ships are being delayed upon arrival at ports, waiting for a berth. As new regulations and increased inspections resulting from post 9/11 changes in security are implemented at port facilities, the delays and congestion will worsen. Given that dry-bulk carriers are utilized to capacity, it is key to minimize the time the carriers spend in port.

Ports compete to attract the business of ocean carriers and major shippers. These carriers and shippers look closely at the inland distribution costs associated with ports-of-call because inland transportation can account for half of the end-to-end cost of an overseas move. Ports that do not offer rail service or that cannot accommodate equipment such as double-stack container cars or heavy bulk cars on key routes are at a competitive disadvantage in attracting and retaining business. As a result, many ports such as Prince Rupert are taking the lead role in making rail access improvements.

A small selection of primary commodities, food, fuel, and ores dominates the total tonnage of freight moved globally. In 1994, coal, farm products, chemicals (and allied products), non-metallic minerals, metallic ores and stone, and clay and glass products constituted more than 70 percent of the tonnes transported by U.S. railroads, and 64 percent of the tonnes shipped in U.S. domestic waterborne commerce in 1994.[45]

Exhibit 36. Global ocean shipping demand has grown in the past three decades.

Year	Crude Petroleum Plus Petroleum Products (trillions of tonne-km)	Dry Bulk Cargo[1] (trillions of tonne-km)	General Cargo[2] (trillions of tonne-km)	Total (trillions of tonne-km)	Containerized Share of General Cargo
1975	15.7	5.0	4.5	25.2	N/A[3]
1980	14.7	6.6	6.0	27.3	20.7%
1985	8.3	7.2	5.6	21.1	30.1%
1990	12.6	8.5	6.5	27.6	35.1%
1995	15.0	9.4	8.1	32.5	43.7%

Source: *Global Transport and Energy Development: The Scope for Change.* World Energy Council, 1998.

Note: N/A = missing data.

[1] Materials shipped unpackaged – coal, grain, ores, fertilizer material.

[2] Materials and goods shipped packaged.

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[45] AASHTO Bottom Line Report.

Dry Bulk Vessel Capacity is Growing Very Slowly.

In recent years, the world's ship fleet, in terms of total Dead Weight Tonnes, has been increasing, albeit slowly—at a rate of 1.3 percent from 1998 to 1999 and 1.6 percent from 1997 to 1998.[46] The largest fleet types—oil tankers, bulk carriers, and general cargo ships—have been increasing at the slowest rate (1.1 percent, 0.2 percent, and 0.2 percent, respectively), while container ships and other types of ships—each less than 10 percent of the global fleet—have been increasing at 4.1 percent and 5.7 percent, respectively.[47]

Of the various vessel types, dry bulk cargo ships are often called the "workhorses" of the world's fleet,[48] comprising 33 percent of the all vessels. Oil tankers comprise an almost equal share. Both of these vessel types are among the largest plying the oceans, although container ships are also increasing in size. The continuous growth in tanker and bulk cargo ships has paralleled growth in trade of their respective commodities (i.e., oil and grains).

Container ships are a more recent addition to the global fleet, with the first purpose-built vessels entering service only in 1965. They have grown substantially in both numbers and average size. This growth in the number and average size of container-hauling ships has paralleled the growth in global container movements. The number of containers handled in world ports increased from 39 million TEU (20-foot-equivalent units) in 1980 to 185 million TEU by 1998.[49]

Growth in container movements in North America, West Europe, the Far East, and Southeast Asia has been particularly rapid (see Figure 6-2). Marine architecture has successfully increased the size and strength of ships so that infrastructure, not technology, limits ship size. For many years, the largest ships were designed to slip (barely) through the locks of the Panama Canal.

Today, with many ships deployed within the Atlantic or within the Pacific, the Panama Canal no longer caps the size of ships. For instance, the largest container ships were once the "Panamax"-class ships capable of carrying 4,000 20-foot containers; today, Post-Panamax ships can carry 6-8,000 TEUs. The size of these behemoths is now limited by the ports, as only deep-water ports can handle the largest ships. These trends are also true of tankers and grain ships.

The economics of ocean shipping are characterized by low line-haul costs, ship costs that get lower per unit of capacity as the ship gets bigger, and significant costs of port operations. Taken together, these three factors cause the costs of international shipping to be dominated not by the ocean voyage but by the landside costs — the rail or truck movement to the port and the handling at the port. As a result, if it is possible to get bulk commodities or containers to a major port at a reasonable expense, it is then possible to ship those commodities or containers to any other major port in the world at a modest additional expense.

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[46] UNCTAD, 2000.

[47] Ibid.

[48] IMO, 1999.

[49] Drewry, 1999.

CONGESTION IN OTHER PARTS OF THE WORLD WILL BENEFIT THE YUKON.

As congestion worsens and the demand for the limited supply of transportation capacity increases, the cost of shipping natural resources from regions that are experiencing congestion will increase. Not only will the unit costs of shipping increase, the cost of doing business in those regions will increase. Congestion slows the flow of goods, creating more in-process inventory and higher carrying costs to businesses. Congestion erodes consistency and reliability in the transport system, causing businesses to have to increase safety stock or experience stock-outs more often.

Finally, when transport systems approach full capacity, they become more fragile and less resilient to disruptions. With limited or no spare capacity, it is impossible to quickly recover from ripples through the network resulting in long delays in the system. Delays decrease the utilization of equipment such as ships, trucks, or railcars further exacerbating problems in the network by creating shortages of equipment. Delays increase the cost of labour as more crew time or driver time is needed to move goods. Examples of such effects may be observed at busy ports where all available berthing slots are scheduled. If a late inbound ship misses its reserved slot time, it often has to wait days or even weeks in a queue for the next available berth. Sometimes these delayed ships are better off being redirected to smaller, less congested ports although the smaller port may be further away and/or have higher fees.

While the Yukon and Alaska do not have a congestion problem, the region does have a mobility problem. As discussed in previous chapters, limited transportation access is slowing the development of rich natural resources in this area, raising costs of inbound energy and goods to residents, and dampening the overall attractiveness of the region for economic development.

As the cost of sourcing raw materials from other parts of the world increases, the relative attractiveness of developing access to the Yukon region also increases. The Yukon is especially well positioned to take advantage of other regions' congestion problems given the nature of the commodities that would likely use the Alaska-Canada Rail Link. Transportation costs are a much smaller component of total costs for high valued, manufactured goods than bulk minerals. Consequently, in congested regions, producers and consumers of expensive goods will be more willing to absorb the increase costs of congestion and squeeze out the shippers of relatively low valued bulk commodities.

THE ALASKA-CANADA RAIL LINK IS CONSISTENT WITH OTHER EMERGING SOLUTIONS.

In the future, as transport costs go up in congested areas, shippers of bulk materials will face three options:

1) Pay the higher costs associated with using a congested transport infrastructure
2) Pay to help expand the capacity of infrastructure in congested areas
3) Develop alternative sources and markets for bulk commodities that bypass transport bottlenecks

Below we discuss some of the trends in transportation investment and management that governments, carriers, and shippers are espousing to address capacity issues and to help ensure efficient mobility for the future.

GOVERNMENTS AND PRIVATE INDUSTRY ARE BUILDING MORE CAPACITY.

Shared use of infrastructure and multi-use rights-of-way lower the cost of developing transportation capacity. Even with the relatively high levels of highway investment, government officials across Canada and the United States are exploring solutions to create more capacity, limit hours of truck operation, and use creative toll pricing to manage demand.

The merits of a number of proposals to widen highways and build new highway interchanges have been challenged by environmentalists, policy makers, and citizens. For example, a coalition of stakeholders is interested in stopping the expansion of U.S. Interstate 81 from two to three lanes through Virginia. The coalition sponsored a study to examine the benefits of subsidizing an alternative plan to widen the parallel Norfolk Southern mainline from single track to double track. Their hypothesis is that a publicly funded railway expansion may provide more capacity and more public benefits per dollar of investment than a similar amount of money spent on widening the highway.

Private transport companies are also expanding capacity. The Class I railroads currently are investing around $2 billion annually for improvements beyond repair and maintenance.[50] For example, CN recently agreed to spend an estimated $4 million to reconnect the only northern rail link between Alberta and British Columbia as part of its B.C. Rail takeover agreement.[51] Trucking companies are buying larger trucks and investing in technology to optimize their usage.

AASHTO is pushing for a larger role in U.S. railway investment.

Broadly speaking, the choice for the nation's freight-rail system is between "market-driven evolution" of the freight-rail system and "public-policy-driven expansion" of the system. Market-driven evolution will accommodate some of the forecast freight growth, but relieve little of the forecast congestion on the highway system. A public-policy-driven expansion could produce a rail industry that provides the cost-effective transport needed to serve national and global markets, relieve pressure on overburdened highways, and support local social, economic, and environmental goals.

Many states have already taken steps consistent with a public policy-driven approach, by investing directly in their rail systems, and by forming public–private partnerships to implement specific projects. But making increased levels of investment and realizing the public benefits of a strong freight-rail system at a national level will require a new partnership among the railroads, the states, and the federal government.[52]

Public Private Partnerships are becoming prevalent in transportation.

Investing in connections is an important part of an overall strategy to extract greater throughput from existing transportation facilities. Transportation professionals have long understood that the efficiency of a transport system is often constrained by the fluidity of terminals. Often, congestion at terminals manifests as problems in the line haul network. Ships queue up at ports waiting for an available berth; trains get delayed on the mainlines outside of yards waiting for a clear tracks.

The most visible example to date of a public private partnership designed at facilitating transportation mobility is the recently opened Alameda Corridor, which serves the ports of Long Beach and Los Angeles. The ports, in cooperation with local, regional, and state governments, developed and implemented a $2.4 billion plan to consolidate the operations of three freight lines and reduce local trucking between port and rail facilities. The result is a single, triple-tracked, fully grade-separated, 20-mile intermodal freight-rail corridor. About half the funding is derived from bonds secured by freight-rail revenues; the remainder is a combination of loans, grants, and tax proceeds. The public benefits of the project included strengthening the economic value of the ports, reducing truck traffic and engine emissions, eliminating congestion at rail-grade crossings, and reconnecting neighbourhoods once divided by the rail lines.

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[50] Ibid., p. 18.

[51] The Daily Herald-Tribune (Grande Prairie, Alberta), July 19, 2004, Monday Final Edition, NEWS; Pg. 1, CITY BACK TO EYEING $3.8M CONTAINER DEPOT, NEAL TALBOT

[52] AASHTO BottomLine Report, p. 19.

Productivity Improvements in Freight Transportation

Historically, improvements in freight mobility occurred for three reasons:

-- Government and, to a lesser extent, private investments in transport infrastructure resulted in more extensive networks that provided more direct routes capable of handling larger vehicles moving more safely at faster speeds.

-- Technological innovations for vehicles and rights-of-way resulted in faster, cheaper, more reliable, and safer transport of larger and more diverse shipments.

-- Institutional, regulatory, and political innovations improved the availability, service, safety, security, and cost of freight transportation. Technological innovation made railroads possible, and support from governments and private investors created extensive networks.

Regulatory and institutional developments allowed shipments to move across several systems, whether those systems were owned by different companies competing within the same region—the case in North America—or spanned several countries—the case in Europe.

NEW TECHNOLOGIES AND INNOVATIVE MANAGEMENT ARE MAKING MORE EFFICIENT USE OF EXISTING INFRASTRUCTURE.

Markets will efficiently match transport demand and carrier capacity.

Railways and trucks compete vigorously on cost and service. While trucks were once widely recognized as dominating lanes less than 500 miles long and widely believed to be the only economic service alternative, those dynamics are changing.[53] Trucks and railways often compete for the same freight. As a result of poorer service and higher truck costs, there are some markets in which railroads have achieved limited success at winning traffic formerly carried by trucks.

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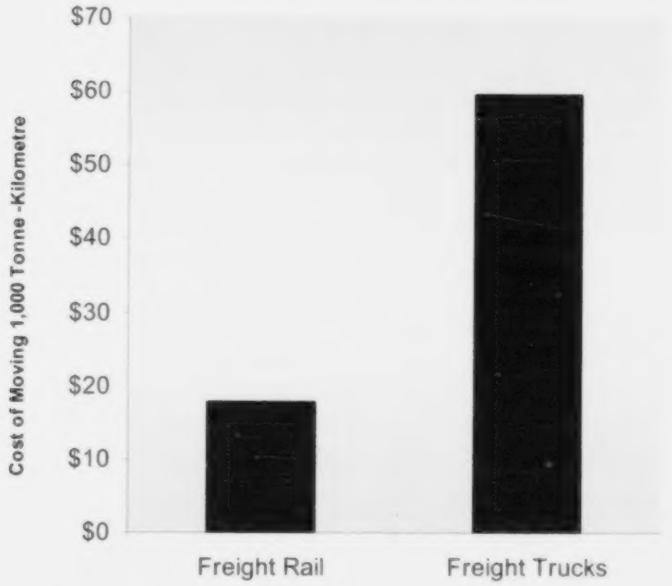
[53] Federal Highway Administration, US DOT, "Exhibit 4-8: Truck and Rail Tonnage Distribution for Shipment Weight and Distance." *1997 Status Of The Nation's Surface Transportation System*, 1997.

Exhibit 37. Shipping costs of freight rail are much lower than those of freight trucks.



Source: AASHTO Estimates for 2000 based on Reebie Associates and Eno Foundation.

Short-haul aggregate moves represent one market where the railroad companies have diverted freight from the highway to the rails. Dedicated unit train service reduces the rail costs below trucking companies' costs by reducing delay at the end points, expediting over the road service, minimizing the number of rail cars required to carry the freight, and taking advantage of economies of scale during the loading and unloading processes.[54]

There are also examples of railroad companies making strides at diverting service sensitive, high-value freight from the trucking companies. Railway companies now run expedited UPS test trains from Los Angeles to New York. Monday morning packages picked up at West Coast customer locations arrive at East Coast terminals in time for UPS to make delivery of the packages to the UPS customers by close of business on Friday afternoon.

Before the development of the interstate highway system, virtually all of the perishable freight moving from California to eastern population centers went by rail. With the advent of transcontinental trucking, railroads lost significant market share to trucks. By 1977, the

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[54] Office of Mines & Minerals, Illinois Department of Natural Resources. "The Mineral Industry of Illinois," at http://dnr.state.il.us/mines/indus.htm.

Southern Pacific and Union Pacific liquidated Pacific Fruit Express, the subsidiary they had created specifically to handle the California perishable market. Railroad market share of California perishables had dwindled to almost nothing by the mid 1990s. However, railroad companies decided to win back that business from truck companies and made significant investments to that end. All of the major roads, East and West, changed train schedules, blocking plans and terminal operations to accommodate the expedited handling of the boxcars full of perishables. Some lanes and customers were given service guarantees that promised full refunds if the cars were not spotted on the promised day. Toward this goal, BNSF railroad recently invested in 700 new, high-capacity refrigerated boxcars.[55]

Positive customer satisfaction is borne out by the 15 to 20 percent annual growth the railroad companies have seen in the perishable market over the last few years.[56] This last example of railroad companies taking traffic from the trucking companies highlights how much of the total freight market is really "up for grabs." Sunkist cooperative, one of the customers in California using the new railroad service, once loaded more boxcars of perishables in a day than Sunkist now loads in an entire year, the balance is being transported in trucks.[57]

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[55] Burlington Northern Santa Fe, "BNSF's Marketing Plans And Efforts," *BNSF Quarterly Report to the Surface Transportation Board*, Finance Docket No. 32760, Decision No. 44, October 2, 2000, at http://www.bnsf.com/about_bnsf/html/report_to_stb.html.

[56] Roy Blanchard, "No Excuses Railroading." *Railway Age*, May 2002, p. 29.

[57] Bill Stephens, "Got Carrots? Can transcontinental perishable trains make a comeback?" *TRAINS*, November 2001, p. 78.

5 Existing and Proposed Regional Infrastructure

INTRODUCTION

Economic Sustainability

The key concerns regarding economic sustainability are whether freight costs will remain low enough for national and international trade to continue to prosper, and whether freight transportation will remain sufficiently mobile to allow continued growth, development, and improvement in the quality of life worldwide.

Freight transportation has enjoyed tremendous productivity growth over the last 50 years. Better roads, better railroads, larger vehicles and terminals, improved communications and control, and cheap oil helped reduce transport costs, despite increases in the costs of materials and labour. In many regions and markets, the productivity gains and low prices are a tribute to the vigour of free markets; freight transportation is one of the most competitive industries, with the lowest margins in the world. How long these trends can continue is uncertain. Symptoms of potential long-term problems include rising fuel prices, public antagonism to very large trucks, the difficulty in handling the largest ships at most ports, and the driver shortages experienced in the United States over the last 10 years.

Throughout much of the world, great economies remain to be achieved through the development of modern highways, railways, ports, and intermodal terminals. Fuel availability and cost are ongoing concerns. Labour shortages are a growing problem in the developed world, although for the foreseeable future, driving a truck will continue to be a relatively high paying job in the developing world. Financing major infrastructure projects is a challenge everywhere. Theory suggests that if the service is worthwhile and provides economic benefits, then somehow these economic benefits can and will be tapped to finance the service.

However, a common problem is that carriers cannot afford to expand, because of competitive forces that keep rates low. Where this is true, as long as the low rates translate into broad public benefits, then the public and their governments need to find a way to deal with the financing problem.

The European Union's efforts to dismantle the regulatory hurdles to freight movement between its member states are probably the most important current example of deregulation. The lessons that the EU learns from lowering barriers to the free and rapid movement of freight will be closely watched.

The proposed railroad must be analyzed in the context of the existing transportation infrastructure in the region. In the following sections, we will review the status of major transportation facilities in the Yukon to better understand the current state of the Yukon's transportation infrastructure, how the proposed rail link might provide a new mode choice, and how the railway would complement or compete with existing infrastructure.

5 Existing and Proposed Regional Infrastructure

HIGHWAYS

The primary Yukon highways are the Alaska Highway and Klondike Highway. The vast majority of the Yukon's population lives along these two corridors and together these two roads comprise almost half of the length of the Yukon highway system. The Dempster, Campbell, and Haines highways serve as secondary roads for the region.

The Yukon Territory has about 3,500 kilometres of primary and secondary 2-lane highways.[58] The Yukon constitutes approximately 5.2 percent of Canada's land area, [59] but accounts for only 3.1 percent of Canada's primary highways, 0.8 percent of its secondary highways, and none of its freeways.[60]

The Yukon highway system is currently meeting the highway needs for the region. Many upgrades continue to the region's roads, especially on the Alaska Highway, as it hosts the majority of the region's traffic. Upgrades on the roads in the past decade have made a significant impact on improving quality and safety. And while there are still some sections that need significant work to bring them up to standard for freight and tourism uses, current traffic needs are being amply met. The following paragraphs give further details about the regions main highways, both their current status and possible future potential.

The Alaska and Klondike Highways

The Alaska Highway runs from Dawson Creek, British Columbia to Delta Junction, Alaska.[61] To facilitate access to Alaska for U.S. troops during World War II, the U.S. Army Corp of Engineers built the road in 1942 in only eight months.[62] It was subsequently opened to the public in 1948. Because the road needed to be built so quickly, many shortcuts were taken in its construction. For example, instead of removing major roadblocks, the road was built to curve around them resulting in many twists and turns along its route. Originally 2,288 kilometres long, the two-lane highway is now only 2,237 kilometres in length due to reconstruction and rerouting as the American and Canadian governments further upgrade the road.

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[58] Transportation in Canada 2003 Annual Report Addendum, Table A7-1. Transport Canada.

[59] Land and Freshwater Area Canada, The Provinces and Territories. www.canadainfolink.ca/chartone.htm Accessed 12/12/03.

[60] Transportation in Canada 2003 Annual Report Addendum, Table A7-1. Transport Canada.

[61] "Yukon's Trans-Canada Highway Route". TransCanadaHighway.com. www.transcanadahighway.com/Yukon Paving/condition. Accessed 12/10/04.

[62] "History of the Alaska Highway", TheMilepost.com. http://www.themilepost.com/history.html. Accessed 12/13/04.

5 Existing and Proposed Regional Infrastructure

The Alaska Highway continues to draw the majority of highway investment in the region. In 1998, the U.S. government's approval of the Transportation Equity Act for the 21st Century included authorization for $94 million (USD) to continue upgrades on the Alaska Highway over the following five years.[63] In 2003, the Canadian government dedicated $40 million for strategic infrastructure priorities in the Yukon, including a $15 million contribution to improve the Alaska Highway.[64]

The Alaska Highway is the primary freight artery in the region. Improvements over the past decades have diverted virtually all freight that once came into Whitehorse by rail via the port at Skagway to the highway. However, there is still plenty of capacity on the corridor. According to the Yukon Department of Highways and Public works, current traffic does not nearly approach the 2,000 vehicles per hour that this asphalt-surfaced two-lane highway is equipped to handle.

The Klondike Highway is 526 kilometres long and connects Whitehorse to Dawson City, located about 80 kilometres from the Alaska/Canada border.[65] Most of this section of the highway between Whitehorse and Dawson city is asphalt-surfaced.[66] The southern extension known as the South Klondike Highway links the Skagway port in Alaska with the Yukon via Carcross.[67]

The Campbell Highway

The Campbell Highway is almost entirely gravel-surfaced except for a few kilometres at either end. Currently, there is only nominal freight and tourist traffic along this road. There are plans to carry out upgrades on the road this summer to raise its standard for industrial and tourist uses. Originally built in the 1960's with the hope of spurring development in the area, development has been minimal. The land through which the Campbell runs is rich in minerals, especially lead, zinc, and silver. If industry were to develop along this corridor, the Campbell highway would require further upgrades to support the added traffic.

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[63] Transportation in Canada 1998 Annual Report. Transport Canada. p. 178.

[64] "Recent Government of Canada Infrastructure Investments hit $750 million for Northern and Western Canada" Infrastructure Canada. News Release, October 14, 2003.

[65] "Yukon's Trans-Canada Highway Route". TransCanadaHighway.com. www.transcanadahighway.com/Yukon. Accessed 12/11/04.

[66] "Highways of the North" www.themilepost.com/hywy_north.shtml

[67] www.gov.tk.ca/yukonglance/highways.html. Government of Yukon Web site. Yukon at a Glance- Highways. Accessed 12/09/04.

Haines Road

Haines Road connects Haines, Alaska to the Haines Junction in the Yukon Territory. This road is primarily used as feeder to the region's main corridors. However, it does have access to tidewater ports and could play a major role in shipping if that type of traffic were to develop.

The Dempster Highway

The Dempster Highway starts near Dawson City, Yukon and runs to Inuvik in the Northwest Territory. It is the only road connecting Inuvik to Whitehorse. The 733-kilometre road is mostly gravel treated with calcium chloride[68] with the first eight kilometres seal-coated and the last 10 kilometres paved.[69] The posted speed limit of 80 km/h[70] is only attainable in some sections.[71] Eagle Plains offers the only re-fuelling station between Dawson City and Inuvik.[72] In addition, the highway is closed for about six to eight weeks in the spring and fall when the Peel and Mackenzie Rivers thaw and freeze.[73]

Currently the Dempster highway is not being significantly upgraded. While the road was not designed to be a major corridor for trade or shipping, it does service Inuvik traffic as well as oil and gas exploration in Eagle Plains. It could potentially be developed as a connecting road to support seasonal intermodal shipments to and from the proposed Alaska-Canada Rail Link.

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[68] "Yukon's Trans-Canada Highway Route". TransCanadaHighway.com. www.transcanadahighway.com/Yukon. Accessed 12/8/04.

[69] "Highways of the North" www.themilepost.com/hywy_north.shtml.

[70] Dempster Highway Road Conditions. http://www3.sympatico.ca/billh56/. Accessed 12/13/04.

[71] "Highways of the North" www.themilepost.com/hywy_north.shtml.

[72] "Yukon's Trans-Canada Highway Route". TransCanadaHighway.com. www.transcanadahighway.com/Yukon. Accessed 12/8/04.

[73] http://www.inuvik.ca/tourism/dempsterhighway.html

5 Existing and Proposed Regional Infrastructure

PIPELINES

THE ALASKA PIPELINE CARRIES OIL TO EXPORT.

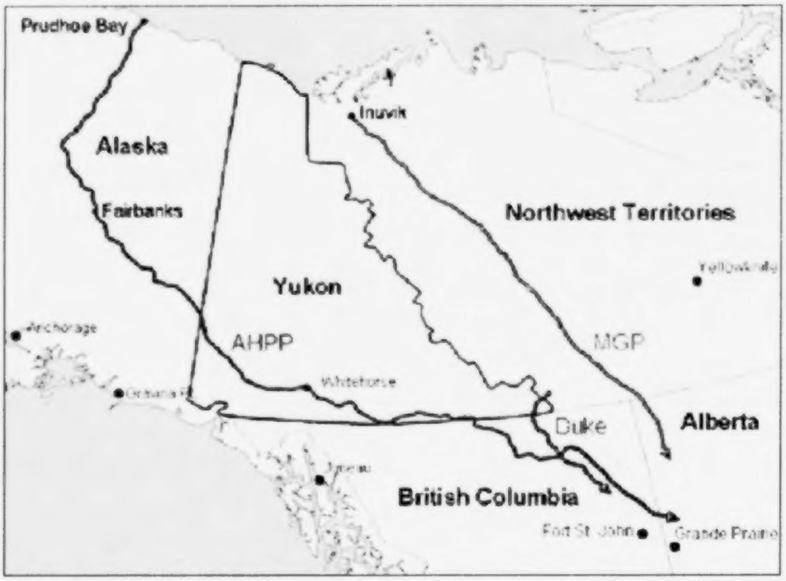
The Trans-Alaska Pipeline System (TAPS) transports oil 800 miles from the Prudhoe Bay oil fields on the North Slope of Alaska to the ice-free port of Valdez, Alaska. It was completed in 1977 and oil first flowed that year. The pipeline is a 48–inch, steel pipeline that crosses mountain terrain as well as hundreds of rivers and streams. For environmental and safety reasons, parts of the line are buried and parts are raised. The pipe carries two million barrels per day of crude oil to storage facilities at the port of Valdez where the crude is loaded on tankers to be transported to various refineries for processing into petroleum products.

THE PROPOSED NATURAL GAS PIPELINE WILL CONNECT ALASKA TO THE LOWER 48.

There have been numerous proposals to get the substantial gas reserves from the Alaskan North Slope to market. The "market" in the various proposals is not always the same. In the case where the market is defined as a gas pipeline market, the term generally refers to the lower 48 states with a focus on the West Coast and the Midwest regions. However, there are other proposals that entail transporting the gas via pipeline to an LNG liquefaction terminal on the Alaskan coast for transport to a market that could be overseas, in California, Mexico or some combination thereof. This debate over routes and markets has a long history, with the various proposals enjoying fluctuating primacy and attention.

In the 1970's, the U.S. and Canadian governments commenced regulatory review of the various proposals. This review resulted in both governments providing approval in 1977 to proceed with an Alaska Highway pipeline project. The U.S. enacted the Alaska Natural Gas Transportation Act (ANGTA) and Canada enacted the Northern Pipeline Act (NPA) to enable pipeline construction. Other than "pre-built" sections in southern Alberta, British Columbia, Saskatchewan, and the Lower 48, the project was never completed. Now, with increased continental demand for natural gas, there is renewed interest in developing northern gas reserves, and hence, pipeline infrastructure.

Exhibit 38. Northern natural gas pipeline options


Prudhoe Bay
Inuvik
Alaska
Fairbanks
Northwest Territories
Yellowknife
Yukon
Anchorage
AHPP
MGP
Whitehorse
Duke
Alberta
Juneau
British Columbia
Fort St. John
Grande Prairie

Source: Yukon Economic Development Web site.

The Alaska Highway Project

This route follows the existing TAPS pipeline as far south as the Alaska Highway where the line turns east and follows the Alaska Highway south to Alberta. Originally, the plan was to connect with the pre-built portions of the line that were completed in 1981/1982 (Foothills Pipeline in Alberta, Canada and Northern Border Pipeline in the United States). The Foothills pipeline has both an eastern and a western leg. The eastern leg, which now transports 2.2 Bcfd, connects to the Northern Border Pipeline in the U.S. and primarily serves the mid-west market. The western leg, which transports 1.1 Bcfd, connects to the PGT pipeline in the U.S. and primarily serves the California market. There are current proposals by the three major North Slope producers to continue the Alaskan line all the way to the Chicago market. Other proposals would connect to the existing North American grid through Alberta.

5 Existing and Proposed Regional Infrastructure

The Mackenzie Gas Project

The Mackenzie Delta gas project is intended to bring gas from the several gas fields in the Mackenzie Delta via a 30-inch pipeline to the Northwest area of Alberta where it is planned to connect to the existing pipeline infrastructure. The development of this project is several years ahead of the Alaska project (2008 v. 2012) and may actually serve the Tar Sands discussed above. This line is a separate project altogether from the Alaskan line and therefore additive to the pipeline activity for the Yukon and Northwest Territories.

ALL ALASKAN ROUTE

The state of Alaska, by referendum, mandated the creation of the Alaska Natural Gas Development Authority (ANGDA) and charged it with assessing the viability and preparing a development plan to deliver North Slope gas to Valdez for liquification. The gas would then be liquefied into LNG where it could be transported to the U.S. West Coast, Hawaii, Mexico, or Asia. As Alaska currently exports LNG from Cook Inlet to Japan, LNG in Alaska would not be a new concept. When the idea of an Alaskan gas pipeline to the lower 48 seems particularly uneconomic, the notion of converting Prudhoe Bay gas into LNG is sporadically resurrected.

There are several limitations to this concept that either restrict what markets can be served or require regulatory or legislative relief. The Jones Act requires a special exemption before foreign flagged vessels can transport any cargo between U.S. ports. This would eliminate California and Hawaii as possible markets as there are currently no U.S. flagged LNG ships. The sole occasion when LNG was shipped between U.S. ports was during a crisis in Massachusetts when an LNG ship from Algeria was delayed during a severe winter period. To avert the crisis, LNG was then shipped from the Elba Island LNG terminal in Georgia (U.S.) to Boston. The Maritime Union insisted that a U.S. crew be on the ship as a condition to not protest (and delay) the transport. However, as no U.S. crew had ever run an LNG ship, the foreign crew actually operated the ship to Boston. Expecting a Jones Act exemption would seem to be problematic.

There is a possible alternative, however. There are several LNG projects proposed in Baja Mexico on the Pacific coast. While some of the LNG is expected to supply the power generation market that is developing there, it is also expected that some of the LNG would be exported North to California or Arizona. This would not involve the Jones Act. However, these projects are well on their way and there is no supply proposal from Alaska on the table today, making this possibility quite questionable.

5 Existing and Proposed Regional Infrastructure

DESIGN CONSIDERATIONS ARE A FUNCTION OF TRANSPORT ACCESS.

The plans for the Mackenzie Delta gas line call for a 30-inch pipeline. Thirty-inch pipe is produced in many steel mills in North America and elsewhere in the world. Even though this pipe is often produced at a lower cost in the Far East regions, transportation logistics can provide a competitive advantage for Canadian or U.S. produced pipe.

The Alaskan pipeline project is a different story. One plans calls for a 52-inch pipeline, possibly using the high strength steel that Exxon has developed in conjunction with a Japanese partner. The advantage of this pipe is that it uses less steel (important in the current high price market for steel) and it is significantly lighter than traditional steel pipe so it can be installed more easily. There are no steel mills in North America capable of producing a 52" pipe so the pipe would have to be manufactured overseas.

Other plans call for pipe from 36- to 48-inch. One company has suggested a 36-inch pipe to start so as not to flood the U.S. market with gas. This would entail a 2.2 Bcfd 36-inch pipeline rather than a 4.5 Bcfd 52-inch pipeline. One of the advantages of this proposal is that the pipe could be domestically produced and shipped by rail.

Exhibit 39. Heavy infrastructure and equipment would be required to build the North Slope to Chicago pipeline.

Requirements for Alaskan Highway Gas Pipeline	
New Infrastructure	
Gravel roads	496 km
Airstrips	5 Upgrades
Pipe Storage yards	32
Camp Sites	31
Equipment	
Loaders	134
Automatic welders	275
Sidebooms	665
Trenchers	18
Backhoes	250
Large Dozers	236
Stringing Tractors	125
Pickup Trucks	1,300
Buses	230
Pipeline	
No. of Compressor Stations	12
Total installed horsepower	600,000 hp
Alaska to Alberta (miles)	2,141
Alberta to market (miles)	1,469
Pipe diameter (inches)	52
Million Tons of steel	5.7

Source: CRA calculations

PORTS AND WATERWAYS

The Port of Prince Rupert anchors the shortest and most efficient land-sea route between North American and Asian markets.

CN Rail's North Line originates at Prince Rupert, extending east to feed into the international CN network reaching directly into the U.S. Midwest with seamless links to Mexico. In partnership with CN, the Port of Prince Rupert offers easy access to major distribution centres across North America.

At 54° north, the Port of Prince Rupert is North America's closest port to Asia by 708 kilometres or 30 hours' sailing time. It is also the deepest natural harbour in North America. The port's strategic location means that ocean carriers can turn around faster and can benefit from faster, expedited transit times between Asian and North American markets. The shortest land-sea route between Asia and the U.S. Midwest is through the Prince Rupert Port. The Port offers immediate access to CN Rail, widely recognized as the most efficient and highest service freight railway in the world. CN indicates it will shuttle containers to the continental hub at Chicago one and one half days faster than from any other port.[74]

Port of Prince Rupert facilities are among the most modern and best equipped in Canada. They consist of six terminals and more than 400 hectares of waterfront land, offering considerable opportunities for industrial development. Designed for high performance, Port terminals include dedicated handling facilities for grain, coal, forest products, specialty grains, cruise passengers, and general cargo. Advanced facilities and state-of-the-art equipment provide fast, efficient turnarounds saving shippers both time and money. New facilities are under development to accommodate the handling of containerized cargo and cruise ship activities. The timing of completion is dependent on attracting more companies to make scheduled ship calls at the port.

As part of the transaction agreement whereby the Canadian National Railway (CN) purchased the operating concession of BC Rail, both CN and the B.C. government agreed to contribute substantial funds to the expansion and modernization of the Port of Prince Rupert. The B.C. provincial government has committed $17 million to expanding and modernizing the Port of Prince Rupert. CN is committed to spending $15 million to modernize its line between Prince Rupert and its mainline track west of Edmonton.[75]

PANAMA CANAL

Over the past three decades, worldwide maritime commerce has expanded at a tremendous rate, fuelled by continual innovation and fierce competition. The Panama Canal serves most of the trade for Asian cargoes moving to the U.S. Midwest and Eastern seaboard. However, rail intermodal traffic in the U.S. has tripled in just over 20 years, reducing the Canal's market share. In contrast, traffic through the Canal has increased only 63 percent from 1970 through 2000, while overall world sea trade increased by 129 percent.

Recent improved on-dock rail infrastructure at the major U.S. West Coast ports is one reason for intermodal's competitiveness. Additional technological improvements and efficiency gains dockside will continue to improve the attractiveness of competing intermodal services.

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[74] Times Colonist (Victoria, British Columbia), June 18, 2004 Friday Final Edition, Business; Pg. D11, CN chief expects big boost from Prince Rupert terminal, Canadian Press.

[75] Ibid.

Until the recent modernization program the Canal faced problems of severe congestion. The program has improved throughput and reduced delays at the Canal through "de-bottlenecking" investments. These investments include dredging, advance scheduling of transits, and tariffs that reflect methods of "congestion pricing," i.e., charging more peak-time transits to encourage less time sensitive shipments to use off-peak times.

The biggest challenge facing the Canal is the economics of maritime trade, which favours larger and larger ships due to dramatic increasing returns to scale. Panamax transits (transits on ships of the Canal's maximum allowable size) neared 40 percent of all transits in 2004 (up 12.5 percent from 2003). Construction of new Post-Panamax containerships, which exceed the Canal's maximum allowable size, is booming, but such ships require alternative routings. To meet the challenge posed by larger ships, the Canal is considering expansion of the Canal's locks. The project may cost as much as $15.4 billion and would be financed through bonds repaid by the Canal's revenue. The loss of that revenue would be a major hit for the Panamanian government, which is currently the recipient of the net revenues from the Canal.

As an element in assessing the risk involved in a Alaska-Canada Rail Link, the government of the Yukon needs to understand the range of possible futures for maritime shipping patterns and how an expanded Canal and a rail link in the Yukon would affect those patterns.

EXISTING RAILWAYS

CN AND THE FORMER BC RAIL

CN recently acquired the operations of BC Rail, the regional rail network formerly controlled by the province of British Columbia. As a stand-alone entity prior to the acquisition, BC Rail was the third largest railway in Canada in terms of continuous track and revenue, and consisted of 2,315 route-kilometres throughout the province.[76] Much of the rail system consists predominantly of single-track line over and between the mountains, rolling hills, and rivers that characterize the British Columbia landscape.

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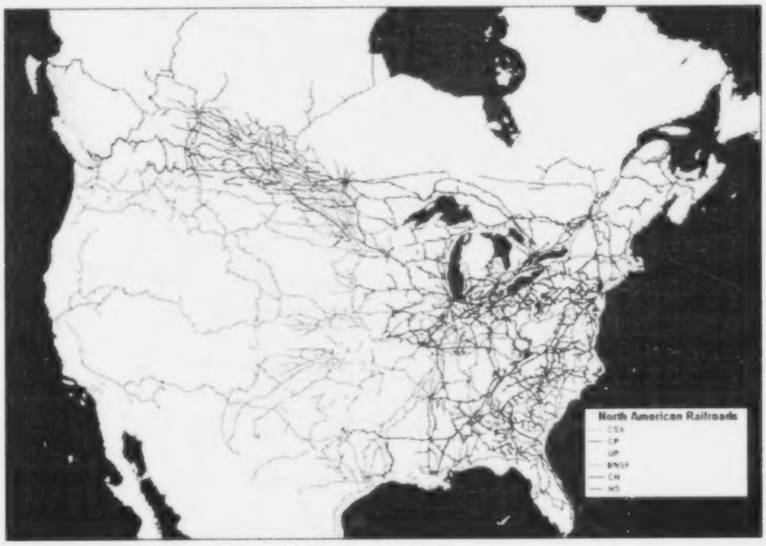
[76] Charles River Associates. "Report of Findings: Fairness Evaluation of the Restructuring of the BC Rail Freight Division." Prepared for the Minister of Transportation, Ministry of Transportation. December 11, 2003.

Exhibit 40. Former BC Rail network connects to a vast and powerful North American rail network.



Source: *National Transportation Atlas Database (NTAD)* 2004.
Note: Showing rail routes accessed from BC Rail through one connecting Railroad.

BC Rail's stations and terminals access the northern areas of the province rich in resources, including lumber, wood chips, wood pulp, logs, coal, sulphur, chemicals, petroleum, and other bulk products. BC Rail connects bulk shippers to key destinations in Canada and the United States as well as major ports handling large volumes of overseas traffic. For example, the BC Rail system includes stations in the far north at Fort Nelson; near the coal fields of Tumbler Ridge in the Rocky Mountains; along the forest industry region near Takla Lake; at Mackenzie, the lumber loading point on Williston Lake; and at Dawson Creek and Prince George, the two CN gateways to eastern Canada. In addition, by way of connecting railroads, customers on the BC Rail network ship commodities to international destinations via ports at Vancouver and at Prince Rupert on the coast of British Columbia, just south of the Alaska border.

Now connected to CN's rail network, BC Rail traffic is directly hauled to a number of critical, distant points for export to other Canadian provinces, the United States, and countries overseas. Most notably, CN links the province to Toronto in the east, the major rail hub of Chicago, and the Mississippi River port of Memphis. CN ships commodities to these U.S. destinations and points beyond on its lines through the grain-producing provinces of Canada and over its recently acquired lines on the former Wisconsin Central system. BC Rail is also connected to other Class I railroads aside from CN, including Canadian Pacific at the Alberta Wheat Pool in Vancouver and Burlington Northern Santa Fe at Vancouver Junction. The map in exhibit 40 shows how CN connects British Columbia to the rest of North America.

The agreement for CN's acquisition of BC Rail also includes economic improvements for the province beyond the increased general accessibility of shippers to external markets. Specifically, the terms of the transfer of operations to CN provided for significant infrastructure investment. For example, CN assumed maintenance responsibility for the general rail infrastructure, allowing the province to save $40 million in annual costs that can be invested elsewhere, and agreed to invest $15 million in new rail infrastructure to support expansion activities at the Port of Prince Rupert. Non-rail projects were also agreed upon, with the province committing to provide $17 million for the Prince Rupert port expansion and $4 million for the Prince George Airport Authority to help with runway and terminal improvements. Tourism is expected to increase in the near future as CN has awarded operating concessions for new tourist- and passenger-train services to third-party operators. Lastly, the overall economy of British Columbia and its neighbouring regions should see added growth from the province's investment of $135 million in "a Northern Development Initiative to support investments in forestry, pine beetle recovery, transportation, tourism, mining, … small business and sustainable economic development."[77]

Aside from CN- and BC Rail-related growth, increasing traffic volumes through the various port facilities in Vancouver have prompted port expansion activities, the most notable of which is the extensive Roberts Bank Container Expansion Program of the Vancouver Port Authority.

ALASKA RAILROAD

The Alaska Railroad is a single-track main line that is 756 kilometres long. It runs from the port of Seward on the Gulf of Alaska to Whittier port on Prince William Sound, northward through Anchorage and Denali National Park, to Fairbanks, and eastward to Eielson Air Force Base. From Eielson there is a branch to Palmer.

It was built in 1923 by the United States federal government but was transferred to state ownership in 1985. It is the only U.S. Railroad offering both large-scale passenger and freight services. Between May and September there are two daily scheduled passenger trains and passenger shuttles between Whittier and Portage. Year-round on Saturdays and Sundays there is a local passenger service that links the state's two major cities, Anchorage and Fairbanks.

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[77] "$1-Billion BC Rail investment partnership moves forward." Press release of the Office of the Premier, Ministry of Transportation, British Columbia. November 25, 2003.

Freight connections with the U.S. rail system come through Seattle and are made via Crowley Marine Service with rail wagons and loose-stowed freight on barges. CN Rail's Aquatrain makes freight connections with the Canadian rail system through Prince Rupert.[78]

For the year of 2003, Alaska Railroad's revenues were $131 million and its net income was $17 million. It owns and leases 1,625 freight cars and 42 passenger cars. Alaska Railroad owns 52 locomotives and has ordered 8 new ones for 2004. In 2003, it carried a total of 446,162 passengers and 8,324,395 freight tonnage. Its revenue carloads were 102,292.[79] Alaska Railroad is self-sustaining; all operating expenses and improvements are paid through revenues generated by passengers, freight service, and real estate.[80]

Alaska Railroad ridership increased by 7 percent in 2003. This is particularly impressive given decreased tourist traffic in this year. Ridership was supported by a new sightseeing service to Grandview and Spencer Glacier and day trips to Seward, which had a 17 percent jump in passengers. For 2003, Alaska Railroad experienced a 26 percent increase in freight carloads largely caused by a 16 percent growth in petroleum product carloads and a 5.3 percent increase in gravel transport.[81]

In 2003, new track, equipment, facilities, and technology were added to the Alaska Railroad and as a result, there was a sharp reduction in delays and an increase in average speed. Over the next five years, Alaska Railroad plans to invest an average of 20 percent of its annual revenue in infrastructure maintenance and to finish the federally funded capital construction project for track improvement.[82]

The Alaska Railroad is a vibrant and healthy operation. It is quite reasonable to expect that all existing rail barge traffic would be diverted to the proposed Alaska-Canada Rail Link and new traffic growth would be induced by a direct rail connection to the rest of North America.

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[78] Jane's World Railways, Forty-fourth Edition, 2002-2003.

[79] Alaska Railroad, "Alaska Railroad 'Quick Facts'" – Web page, http://www.alaskarailroad.com/corporate/FactSheet.html.

[80] Alaska Railroad, webpage, http://www.alaskarailroad.com/freight/index.htm.

[81] Alaska Railroad, 2003 Annual Report.

[82] Ibid.

5 Existing and Proposed Regional Infrastructure

WHITE PASS AND YUKON RAILWAY

The White Pass and Yukon Railway was built in 1898 during the Klondike Gold Rush to transport prospectors and equipment inland and haul mineral ore to the port. It is a narrow gauge railroad and carries vintage parlour cars. Along its 177-kilometre route are mountains, glaciers, gorges, waterfalls, tunnels, trestles, and historic sites. Due to these views, the White Pass and Yukon Railway is sometimes called the "Scenic Railway of the World." It connects the port of Skagway, Alaska to Whitehorse, Yukon. In 1982, the White Pass and Yukon Railway was closed due to low mineral prices that collapsed the Yukon's mining industry. In 1988, the railway was reopened as a seasonal tourism operation. Today, the railway is Alaska's most popular excursion with more than 310,000 passengers. It has 20 diesel-electric locomotives, 61 restored and replica parlour cars and one steam locomotive in its fleet.[83]

The White Pass and Yukon Railway is used for different excursions that vary by distance along the railway. The first 64 kilometres of the 177-kilometre railway is used for these excursions. The excursions are available from May through September. The White Pass Summit Excursion is a three hour round trip that climbs from tidewater at Skagway to the summit of White Pass, a 2,865 foot elevation. The Lake Bennett Excursion is an 8.5 hour, 129-kilometre round trip that goes beyond the White Pass Summit by 32 kilometres to Bennett, British Columbia. Travel time is 6.5 hours with a 2-hour layover for exploration. The Sunday Steam Summit & Fraser Meadows is a 4-hour, 84-kilometre roundtrip that goes 10 kilometres past the White Pass Summit to Fraser Meadows.[84]

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[83] White Pass & Yukon Railroad, http://www.whitepassrailroad.com/

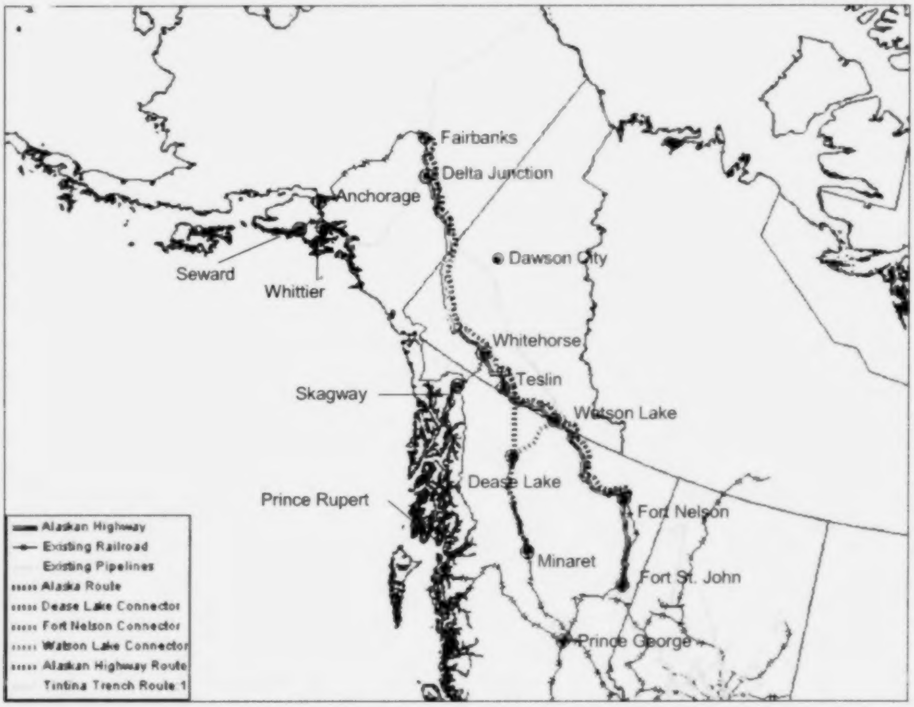
[84] Ibid.

5 Existing and Proposed Regional Infrastructure

PROPOSED ALASKA-CANADA RAIL LINK

The proposed Alaska-Canada Rail Link could connect the Alaska Railroad to the north with the British Columbia railway (now Canadian National Railway) at two different locations to the south. One connection would target north-south flows of traffic from Alaska and the Yukon to the Pacific Northwest region of the United States. The second connection would link Alaska to the majority of the Canadian provinces, the Midwest, and Eastern regions of the United States.

Exhibit 41. Proposed route alternatives for the Alaska-Canada Rail Link


Fairbanks
Delta Junction
Anchorage
Dawson City
Seward
Whittier
Whitehorse
Teslin
Skagway
Watson Lake
Dease Lake
Prince Rupert
Fort Nelson
Minaret
Fort St. John
Prince George
Alaskan Highway
Existing Railroad
Existing Pipelines
Alaska Route
Dease Lake Connector
Fort Nelson Connector
Watson Lake Connector
Alaskan Highway Route
Tintina Trench Route 1

Sources: *Report on Survey Trans-Canadian Alaska Railway Location*, 1942 U.S. Army Corps of Engineers, and *Alaska – Canada Railroad Corridor Feasibility Study*, Canadian Arctic Railway Company, 2004.

5 Existing and Proposed Regional Infrastructure

THE ALASKA PORTION WILL HAVE FEW BARRIERS TO CONSTRUCTION.

The Alaska Railroad currently ends thirty-two kilometres southwest of Fairbanks at Eilson Air Force Base. The rail line would need to be extended from Eilson through Delta Junction to the Yukon border near Beaver Creek. The suggested route would parallel Route 2, also known as the Alaska Highway. The distance from Eilson to Delta Junction is about 113 kilometres. The state of Alaska has recently authorized the Alaska Railroad to issue bonds to construct this segment of the proposed route to serve military facilities near Delta Junction; however, the proposed funding mechanism for the extension would require the U.S. Department of the Army to pay debt service on the bonds.[85] From Delta Junction to Alcon is around 320 km. As this route parallels an existing highway, minimal environmental impacts are expected.

ALTERNATIVE ROUTES THROUGH THE YUKON MUST BE CAREFULLY EVALUATED.

Currently, there are two suggested routes through the Yukon Territory. The first is the Alaskan Highway route. The second route, originally proposed the U.S. Army Corps of Engineers in 1942, takes a more northerly course down the Tintina Trench.

The Alaskan Highway Route would parallel existing highways.

From Beaver Creek to Whitehorse, the route suggested by the Canadian Arctic Railway Company would follow alongside Yukon Route 1 via Haines Junction to Whitehorse. Like the new Alaska segment, environmental impacts are expected to be minimal since the line is next to an existing highway. Distance from Beaver Creek to Whitehorse is 480 kilometres.

Continuing to parallel Alaskan Highway, the proposed rail line would be built from Whitehorse to Teslin, near the Yukon/British Columbia border. Distance is about 210 kilometres.

At Teslin, three alternative routes have been suggested. The shorter route, called the Dease Lake Connector, totals about 610 kilometres. The second route, the Fort Nelson Connector, is about 770 kilometres. The third alternative, the Watson Lake Connector is about 850 kilometres.

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[85] State of Alaska website, "Governor Signs Alaska-Canada Rail Link Bills, "June 4, 2004 (http://gov.state.ak.us/archive.php?id=1032&type=1).

5 Existing and Proposed Regional Infrastructure

The Tintina Trench follows river grades and accesses many mineral deposits.

In 1942 the U.S. Army Corps of Engineers mapped out a route for a possible rail line from Prince George, British Columbia, to Fairbanks, Alaska. In the midst of World War II the U.S. Army was concerned about getting supplies to Russia.

The army route follows the Tintina Trench, along the Ladue River Valley in Alaska crossing into the Yukon from Tetlin Junction, Alaska. Once the Ladue meets the White River the route would parallel that river then the Yukon River valley via Fort Selkirk. At the intersection of the North Klondike Highway, the suggested route follows the highway south to Carmacks. From Carmacks, the Army report suggests a route roughly the same as the Robert Campbell Highway all the way to Watson Lake. This route would be west along the Salmon River past Salmon Lake, along the Pelly River, then through the Frances River valley past Frances Lake and then finally paralleling the Liard River south into Watson Lake. From Watson Lake the army report suggests a route similar to the Fort Nelson connector described above.

The U.S. Army Corps of Engineers were experienced and considered the difficulty of construction and or rail operations. The Corps believed their suggested route offered few construction difficulties. For ease of operation, grades would be two percent or less, modest by railroad standards.

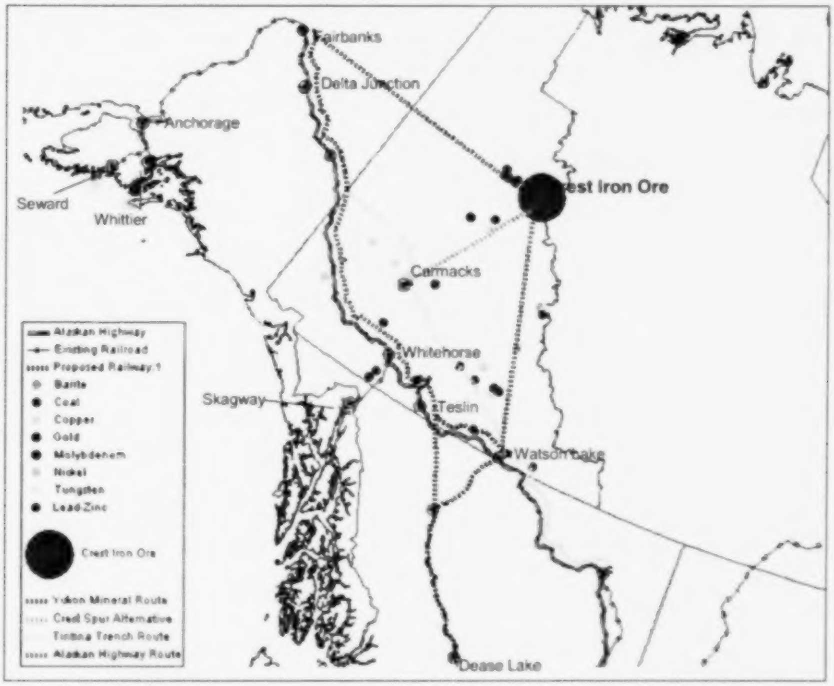
Additional route alternatives should be assessed.

Work to date regarding route selection for the proposed Canada-Alaska Rail Link has focused on the ease of construction and access to Alaskan markets. Canada and the Yukon would be well served by considering other route alternatives that maximize access to Yukon mineral deposits thus motivating resource development. Route selection must trade off length of haul, distance from mines to the trunk line, severity of route, and environmental impacts. Longer routes cost more to build and operate. Routes with many hills, curves, and bridges also cost a lot to build and maintain. Modern survey technology, engineering CAD systems, and GIS analyses can assess the many attributes of each route relatively easily and provide a framework for analyzing these tradeoffs.

5 Existing and Proposed Regional Infrastructure

The Crest iron ore mine alone may produce over 5 billion tons of ore. In contrast, the other 33 mines or potential mines discussed in this paper are each less than 200 million tons of ore. Accessing Crest would contribute to the economic viability of this project. Adjacent, smaller mines would then also benefit. Should the Crest rail line be constructed as a spur to one of the proposed routes? Or, should a third mainline routing option be considered that focuses on accessing the maximum amount of mine reserves? Exhibit 42 shows these additional alternatives, demonstrating the complexity of route alternative analysis and selection. A detailed feasibility study needs to encompass all of the engineering, operation, commercial, economic, social, and environmental implications of each route alternative.

Exhibit 42. Large Crest iron ore deposit may influence route selection.


Fairbanks
Delta Junction
Anchorage
Seward
Whittier
est Iron Ore
Carmacks
Whitehorse
Skagway
Teslin
Watson Lake
Dease Lake
Alaskan Highway
Existing Railroad
Proposed Railway 1
Barite
Coal
Copper
Gold
Molybdenum
Nickel
Tungsten
Lead-Zinc
Crest Iron Ore
Yukon Mineral Route
Crest Spur Alternative
Tintina Trench Route
Alaskan Highway Route

BC Connecting Routes

South of Teslin, three potential routes are proposed to connect to CN railway: the first cuts through undeveloped territory from Teslin to Dease Lake, connecting to an abandoned right of way from Dease Lake to the end of the BC Rail Takla branch; the second parallels highways from Teslin to a connection with CN at Fort Nelson; the third proposed route parallels highways from Teslin to Watson Lake to Dease Lake connecting to the abandoned Takla branch.

5 Existing and Proposed Regional Infrastructure

The Dease Lake Connector

The first leg from Teslin to Dease Lake accesses territory without a highway. There may be concerns as this route is near wetlands areas and parallels river valleys. In addition, there could be opposition from First Nations groups concerning new rail construction in undeveloped territory.

The route parallels Teslin Lake and the Alaskan Highway southwest out of Teslin for a short distance and then follows the Teslin River valley south to the Inklin River valley to the Sheslay River and then follows the Tanzilla River towards Dease Lake until linking up with a British Columbia Rail abandoned right of way south of Dease Lake. The distance of the Teslin-Dease Lake line is approximately 290 kilometres.

There is a graded right of way built by BC Rail as part of the Takla Subdivision in the 1970's from Dease Lake to the current end of the Takla Branch of BC Rail at Minaret. Bridges were also constructed on this route but track was only constructed as far as Dease Lake. The graded segment without tracks is 320 kilometres. Once on the Takla branch, traffic would flow about 480 kilometres to Prince George. At Prince George there are connections to the major east-west mainline of the Canadian National. Traffic could also continue south on BC Rail to Vancouver and beyond.

The line from Minaret to Fort Saint James, British Columbia is currently maintained as a light density branch with the last 95 miles of rail weighing a light 85 pounds per yard. Thus given the expectation of volume on a Yukon/Alaska route, this line will need considerable upgrading.

The Dease Lake Connector route is the shorter route that includes more than 50 percent of already graded right of way. Total distance from Teslin to Prince George is approximately 1,100 kilometres.

The Fort Nelson Connector

The Fort Nelson Connector parallels roads for it entire distance. From Teslin to Watson Lake in the Yukon, this route follows the Alaska Highway. The distance from Teslin to Watson Lake is about 290 kilometres. The Watson Lake—Fort Nelson leg is about 480 kilometres. At Fort Nelson the proposed railroad would connect with CN. The Fort Nelson branch line has heavy grade rail and is well maintained.

From the end of the Fort Nelson branch to Prince George is about 770 kilometres on existing railway. Total distance from Teslin to Prince George is about 1,540 kilometres.

Watson Lake Connector

There is a suggestion that at Watson Lake a rail line might be constructed south next to the Stewart Cassiar Highway to Dease Lake then connect to the already graded segment of CN railway. The distance from Watson Lake to Dease Lake is approximately 240 kilometres. Total distance from Teslin to Prince George on this route is about 1,350 kilometres.

THE PROPOSED RAIL LINK WILL DIVERT FREIGHT FROM OTHER SHIPPING MODES.

An Alaska-Canada Rail Link would create a new means of transporting goods into Yukon and central Alaska from the lower 48 U.S. states and the rest of Canada. Freight traffic into the region from the south currently arrives in the region via the Alaska Highway, via containers and trailers on vessels through the port of Anchorage, and via rail barge service to the port of Whittier. Some of this existing traffic would almost certainly be captured by the Alaska-Canada Rail Link; for example, one would expect the railroad to capture virtually all of the current rail barge traffic and a substantial fraction of any long-distance truck traffic utilizing the Alaska highway; in addition, intermodal rail service might well displace vessels for the movement of some container and trailer traffic into interior Alaska destinations. Rail transportation will be utilized as a substitute for other currently used modes only when it offers lower costs or superior service; the benefits of lower costs and improved service will be reflected in lower acquisition costs for goods transported into the region.

6 Relevant Policy Issues and Potential Public Benefits

INTRODUCTION

Effectively developing the Alaska-Canada Rail Link will require cooperation of both the U.S. and Canadian governments as well as the governments of Alaska, the Yukon, and British Columbia. Government involvement will address two essential functions related to this project's development. First, government will ensure that external costs and benefits not captured in market demands and prices are taken into account in developing the corridor. Second, government will reduce transaction costs that might hinder the private development of the corridor by disseminating information, removing bureaucratic barriers, and coordinating diverse interests.

EXTERNAL COSTS AND BENEFITS REQUIRE GOVERNMENT INVOLVEMENT.

External costs, also referred to as "externalities," become economic costs when the actions of individuals, firms, or governments create spillover costs for other parties, the value of which is not priced in the marketplace. The most familiar example of an external cost is environmental pollution. There can also be external benefits, where spillover benefits go unpriced. For example, certain private actions may aid national defence and security to the benefit of everyone, and yet may not bring the provider any direct economic reward. From a social perspective, when external costs or benefits are significant, private parties face the wrong set of economic incentives. If external costs and benefits go unpriced, private parties will undertake too many economic activities generating external costs and too few economic activities generating external benefits. In such circumstances, government has a clear role to play in helping markets achieve a balance between social costs and benefits.

Exhibit 42. Government should be involved in large and complex projects.

	Purely Private	Significant Public Involvement	Purely Government
Attributes	Limited or no externalities Minimal coordination / transaction cost problems	Significant externalities Significant coordination issues	Extensive externalities Significant coordination / cost issues
Examples	Private Housing Retail Stores	Port Development Environmental Clean-Up Telecommunications (Standard Setting and Spectrum Allocation)	National Defence National Highway System

In the case of the Alaska-Canada Rail Link, there are numerous potential external costs and benefits that may not be properly priced by private markets and that will need to be taken into account as decisions are made as to whether, how, and when to develop the corridor. These include environmental impacts; the effect of the corridor on regional economic development, economic integration, and Canadian sovereignty; and the benefits the corridor may create for Canada and the United States' national defence.

ENVIRONMENTAL COSTS AND BENEFITS

Government clearly has a role in protecting the environment and ensuring appropriate measures are taken to minimize the environmental impacts of development. Building the Canada-Alaska Rail Link will likely entail a wide range of potential costs and benefits to the natural environment. On the cost side, corridor development could encroach on environmentally sensitive areas, requiring government involvement in route selection and in the creation of appropriate laws and oversight mechanisms. This would ensure that the railroad and other transportation entities sharing the corridor would be given the appropriate incentives to operate in an environmentally sensitive manner.

The creation of the corridor could also lead to substantial environmental benefits. It would be beneficial if the rail corridor were to divert freight that would otherwise be transported via the Alaska Highway since rail is a less energy-intensive mode of transport, and generally more environmentally friendly than road transportation. In addition, if the development of the corridor spurs the creation of a natural gas pipeline linking Alaska and the rest of North America, this would allow for greater regional gas supplies, thereby making this relatively clean energy source a potential substitute for other fossil fuels.

6 Relevant Policy Issues and Potential Public Benefits

Assessing the net environmental costs and/or benefits from creating the corridor is beyond the scope of this current study and will, in any case, depend on policy choices that are ultimately the responsibility of the relevant governmental authorities. A detailed feasibility study should include a detailed assessment of environmental impacts.

REGIONAL ECONOMIC DEVELOPMENT, ECONOMIC INTEGRATION, AND SOVEREIGNTY

Developing the corridor has the potential to bring enhanced economic activity, employment growth, and population growth to regions in the Yukon, Alaska, and northern British Columbia. However, private markets place no inherent value on economic development taking place in one region rather than another. From the perspective of the citizens of these regions and the citizens of Canada and the United States, developing these regions may produce substantial benefits not captured in market prices and returns. Among these benefits are the value resulting from better integration of the Yukon's economy with the rest of Canada's, the potential of bringing economic benefits and greater economic integration to First Nations' communities, and the value for Canada of spurring economic development in northern Canada as a means of increasing the region's population and strengthening the nation's claim to sovereignty of its Arctic regions. For Alaska and the United States as well, there may be benefits to further integrating Alaska's economy with those of Canada and the lower 48 States.

From a local and regional perspective, corridor development will produce direct economic benefits for affected communities in the form of new economic activity and associated employment in construction, maintenance, and operation of the railroad and other corridor infrastructure. Economic benefits will also take the form of new activity as investments in mining—which only becomes feasible when there is the appropriate transportation infrastructure—take place, and in the form of lower consumer prices as better freight transportation lowers the costs of bringing goods into the Yukon and Alaska. New economic activity will perpetuate further economic activity locally via "multiplier effects" as higher local incomes and higher population growth result in increased demand for locally produced goods and services, such as shopping, education, and the development of local transportation infrastructure.

From the perspective of the national economies of Canada and the United States, some of these regional economic benefits may be offset by costs elsewhere in their economies. This would occur to the extent that investment devoted to development along the corridor would displace funds that might have otherwise been invested elsewhere. The extent of this displacement will depend on the source of investment funds. If the corridor development attracts funds from external investment sources that otherwise would not have been invested in U.S. or Canadian assets, the displacement will be proportionately less serious.

Assessing and documenting the development effects of corridor development at local, regional, and national levels will not occur without government involvement. It is clearly the role of the relevant governments to make decisions about what weight to place on the various economic and non-economic benefits and costs that corridor development may bring.

DEFENCE

U.S. forces in Alaska play an important part in safeguarding international security. Alaska is home to a wide range of U.S. air, ground, coast guard, and missile defence forces. However, the lack of a suitable land link to the more populous areas of North America constrains the speed with which forces—particularly ground forces—based in Alaska can react to international crises and cooperate with forces further south. In this context, the proposed rail link would bring three important military benefits.

First, the Alaska-Canada Rail Link would also enable better opportunities for joint training at CF Bases in the west. Canadian Forces have, in the terminology of business economics, a comparative advantage and a core competency in providing multinational training. The main factors in Canada are vast quantities of open land and free airspace, native proficiency in English (the language of most international military operations), and a quiet but vigorous commitment to multilateral security. Consequently, many allied nations look to Canada for its large-scale military training requirements. Canadian Air Command and Bombardier run an extensive aircrew training operation from installations such as CFB Cold Lake that trains fighter pilots from several NATO air arms and the Singaporean Air Force. The Canadian Forces Manoeuvre Training Centre (CATCH) Wainwright in Alberta has room for the simultaneous and combined exercise of entire mechanized brigades. CFB Suffield, also in Alberta, is also known as British Army Training Unit in Suffield (BATES). The facility is a live-fire manoeuvre training ground the size of Luxembourg over which the British Army drives entire armoured regiments, periodically flying in new troops from the United Kingdom.

The proposed rail link can play an important role in enhancing the value of CFB Wainwright and Suffield. Nearby CFB Edmonton is the headquarters of 1 Canadian Brigade Group—about one-third of the Canadian Army's combat power—and of all Canadian land forces in the west. Motorized troops in Alaska could reach the Alberta training areas by road and rail in about a week's loading and movement. Completing the rail link would thus place over half the U.S. Army's LAV-III units within easy reach of these bases. The U.S. Army and Marines do maintain their own training facilities in southern California at Fort Irwin's National Training Center and the Marine Air-Ground Training Center Twenty-nine Palms. However, these facilities are not fully competitive with the BATUS and CMTC Wainwright as training grounds: the climate is rather different at all times of the year, they are considerably farther from Forts Lewis and Richardson, and they are optimized for desert warfare with tracked forces. In short, Canadian facilities have much to offer, and their attractiveness would increase considerably with the construction of the rail link.

Second, the proposed rail link would bring better mobility for U.S. Army troops stationed in Alaska. Forts Richardson (outside Fairbanks) and Wainwright (outside Anchorage) are the homes of the U.S. Army's 172nd (motorized) Infantry Brigade, a formation of about 3,700 troops equipped with roughly 800 trucks and 300 LAV-III armoured cars, or 'Strykers.' Five of the seven Stryker brigades are to be stationed in the Pacific theatre, a sixth active brigade will be posted to Germany, and a seventh is planned for reserve status with the Pennsylvania National Guard. Transporting Strykers by air from Forts Richardson and Wainwright is difficult, involving a multi-stage voyage on Hercules transports, the C-17 Globemaster III, and C-5 Galaxy transports. Sealift is often easier and faster than air transport, yet deployment must wait for the arrival of the roll-on, roll-off (ro-ro) transports stationed on the U.S. Gulf and Atlantic coasts, where they are better positioned to support the movement of heavy armoured forces towards the Middle East.

The arrival of the Alaska-Canada Rail link would provide a third option of deployment by rail to the lower 48 States. The brigade could load its vehicles and stores onto flatbed rail cars, and ship them to a port of embarkation on the U.S. Gulf or Atlantic Coast. From there, long-distance deployments could be made via 27-knot FSSs or 24-knot LMSRs, which have transoceanic range. Deployments in the Caribbean could be undertaken with the Army's new Theatre Support Ships (TSVs), which are 1100-ton, aluminum-hulled catamarans. The entire squadron of twelve active-duty ships would be required to carry the brigade (and not much of its supplies), but it could do so at forty knots.

We can cite three representative scenarios in which Stryker forces might be required: renewed ethnic fighting in Haiti, Nigeria, and Kosovo. These can be taken as representative of destinations in the Caribbean, west Africa, and the eastern Mediterranean, as the deployment times would be broadly comparable. Exhibit 43 compares the deployment times under the three aforementioned conditions: without transport ships or a transcontinental railroad nearby, with ships nearby but no railroad, and with the proposed Alaska-Canada railroad bringing the troops and their materiel to an embarkation point on the U.S. Atlantic coast (by way of example here, the port of Charleston, South Carolina).

Exhibit 43. Deployment times in days for a motorized brigade at Fort Richardson, Alaska[86]

	By sea - waiting for ships	By sea - ships in Alaska	By rail and sea - from the East Coast
To Kosovo	33.1	24.6	24.0
To Nigeria	31.6	22.1	22.6
To Haiti	25.1	15.6	15.8

Source: CRA calculations.

Third, linking Alaska to the lower 48 will also enhance security in Northeast Asia. By opening another transport link to Alaska, the proposed railroad would enhance its role in ensuring the security of northeast Asia and North America. The U.S. Army and Air Force are completing their construction of missile defence interceptor silos at Fort Greely (outside Fairbanks) and a missile defence tracking radar on Shemya Island. These bases are primarily intended to guard against the launch of North Korean ballistic missiles against North America. Once operational, they will require minor logistical support, but they do not represent on their own the only northern contribution to air and missile defence.

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[86] Our estimates of deployment times are drawn from several sources, including the U.S. Army's Field Manual 100-61, Armor and Mechanized-Based Opposing Force Operational Art (January 1998); Alan Vick, David Orletsky, Bruce Pirnie, and Seth Jones, *The Stryker Brigade Combat Team: Rethinking Strategic Responsiveness and Assessing Deployment Options*, MR-1606 (Santa Monica: RAND, 2002); and the experience of CRA staff members with intermodal rail, road, and ship operations.

6 Relevant Policy Issues and Potential Public Benefits

The U.S. Navy is developing shipboard interceptors missiles for destroying missiles in the boost phase of flight, when their rocket motors are burning with an easily detected plume, and during which they cannot easily manoeuvre to avoid targeting. An effective defence, however, requires stationing at least one missile defence ship, and more likely two or three, in the northern Pacific outside North Korean territorial waters. Thus, an opportunity exists for the Navy to develop a port facility in Alaska to handle some of these ships. The Navy currently has four area air and missile defence ships home ported in Yokosuka, Japan, as part of Destroyer Squadron Fifteen: the Vincennes, Curtis Wilbur, John S. McCain, and Fitzgerald. Those, however, generally support the carrier and amphibious groups in the western Pacific, and are not always available for guarding against North Korean missile attacks, an event that could come without proper warning. The pickets that would guard against this eventuality could be sent from Pearl Harbour or San Diego, but a port such as Anchorage or Seward would be closer, which would increase the ships' time on station. Alaska is also a less expensive location for the ships and the crews than Japan. The proposed rail link would only improve that cost position.

MULTIPLE ACCESS ROUTES AND NATIONAL SECURITY

In times of emergency, a country's national security can hinge on its ability to access the equipment, goods, and other materials it needs to respond appropriately. To facilitate the efficient transport of supplies, it is important to have multiple access routes both to increase the speed and capacity at which the supplies travel, as well as to serve as a back up route should one route or the other become unavailable. In the case of Alaska and the Yukon, the existing Alaska Highway is insufficient for securely moving goods during times of war and/or disaster. The addition of a second, multiuse corridor, such as the proposed railway, could prove to be of critical importance in ensuring Canada and the United States' national security.

GOVERNMENT HAS AN IMPORTANT COORDINATING ROLE.

Institutional Requirements of Sustainable Mobility

There is one additional major sustainability task facing all modes in all parts of the world—the job of developing sufficient institutional capacity to enable the other challenges to be met. Technology offers hope in solving (or at least mitigating) many of the challenges to achieving sustainable mobility. But technology cannot do this on its own. Transportation systems are very complex, very long-lived, and affect large numbers of people in many different ways. Building consensus about what needs to be done to make mobility sustainable, and then implementing what this consensus implies, will be a tremendous challenge, especially in democratic countries where everyone with a stake in something can demand to be heard.

From a social perspective, there is clear role for government to play in developing the information that will assist private investors in making decisions about whether and where to invest in developing the Corridor. While private firms have ample incentives to engage in research and to develop information, the benefits of which they can easily appropriate, they are understandably reluctant to undertake investments in research, the benefits of which potentially extend well beyond their own potentially narrow uses. This reasoning explains how government can benefit society by supporting basic research, while leaving research that leads to readily commercialized products and services to the private sector.

Preliminary work in assessing the economic feasibility of Corridor development falls into the category of basic research that is appropriately supported by government. The benefits that developing the Corridor may provide to private interests, while potentially substantial, are likely to be widespread, relatively diffuse, and subject to numerous individual uncertainties. For this reason, no single private party is likely to undertake the relatively far-ranging study that will be needed to assess the value of the widespread and diffuse benefits, and to assess all of the potentially relevant costs and uncertainties that could stand in the way of corridor development. Once all potentially interested parties have been presented with the results of such a study, it could serve as a spur for them to undertake further studies and investments needed to effectively develop the Corridor to help develop more fully developed business and policy cases for (or against) Corridor development. Absent the support of basic research like that proposed for joint funding by the U.S. and Canadian governments, however, the potentially worthwhile Corridor development could be the subject of unnecessary delays or even be foregone entirely.

6 Relevant Policy Issues and Potential Public Benefits

Governments can often help facilitate private investment by overcoming coordination and information problems that markets cannot easily overcome. One clear coordination issue that will require government intervention is the question of right-of-way acquisition; government powers of eminent domain will be required to acquire any private lands needed in assembling the corridor. Guarding against "hold-up" demands for compensation to private landholders and resolving First Nations' concerns about land access and sovereignty can best be addressed on a government-to-government basis.

Quite apart from assembling the land for the chosen corridor path, government will also have a major coordinating role to play in facilitating site selection for the corridor. In part, this will reflect the government's role in taking environmental, economic development, defence, and other externalities into account, but it may also be necessary to help mediate between conflicting demands among potential private customers and investors, each of whom may favour routings that maximize their own access to the corridor. Such disputes can often be easily mediated without outside involvement when numbers are small. But, as this study shows, a proposed railroad may make sense only if it serves a relatively large number of dispersed customers, creating potential coordination issues that governments may be positioned to mediate.

7 Preliminary Traffic Forecast and Next Steps

INTRODUCTION

In this paper, we have detailed a number of substantial benefits that would precipitate from the development of the proposed rail link between Alaska, the Yukon and the northern Canada region. Our analysis has focused largely on mineral and energy developments that could be facilitated by development of the proposed rail link, as well as the potential role the link could play in national defence.

In this chapter, we will examine other potential benefits from the railroad. We discuss issues that might be considered in a detailed feasibility study. We recommend such a study to further understand the projected benefits and costs of a Alaska-Canada Rail Link, to quell concerns about unsubstantiated claims both for and against the project, and to lay the ground work and provide a framework for future initiatives both in the private and public sectors.

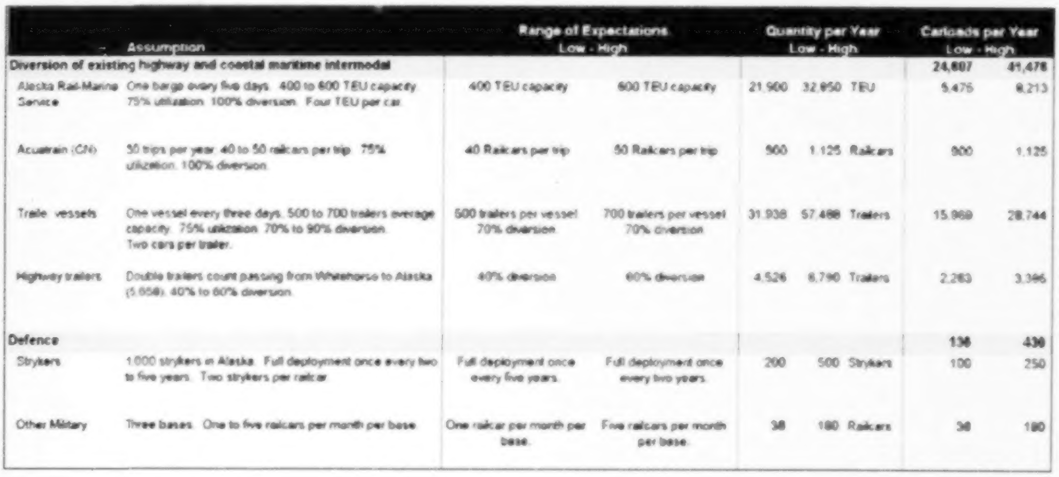
PRELIMINARY TRAFFIC FORECAST

This paper explores the industries that are most likely to use the proposed Alaska-Canada Rail Link. Clearly, as the project unfolds, various development efforts in mining, energy, pipelines, and defence will be developed at different rates. It is likely that existing freight flows between Alaska and the lower 48 will immediately divert to the new, all-rail route, assuming significant cost savings can be achieved. It is likely that new pipeline construction will also account for much of the initial traffic on the new rail link with volumes decreasing as the pipelines near completion. Mine development and outbound mineral resources will have relatively longer lead times and will be dependant on global prices, the chosen route alternative, and the availability of supporting energy sources and supporting local economies.

While a detailed traffic forecast is not within the scope of this study, the following exhibits present a first approximation of the volumes of various freight flows that are likely to make use of the new railway. The projected volumes represent a long-term, steady state level of flows. Additional analyses would be required to detail each specific flow, predict the timing of that flow, and bound the assumptions and probabilities associated with each. In addition to the flows summarized in these tables, the prospect of lower transportation costs will fundamentally change community development and economic activity as previously inaccessible areas are opened to development.

7 Preliminary Traffic Forecast and Next Steps

Exhibit 44. Forecast of existing flows that may divert to Alaska-Canada Rail Link



	Assumption	Range of Expectations Low	High	Quantity per Year Low	High		Carloads per Year Low	High
Diversion of existing highway and coastal maritime intermodal							**24,607**	**41,478**
Alaska Rail-Marine Service	One barge every five days. 400 to 600 TEU capacity. 75% utilization. 100% diversion. Four TEU per car.	400 TEU capacity	600 TEU capacity	21,900	32,850	TEU	5,475	8,213
Acuatrain (CN)	30 trips per year. 40 to 50 railcars per trip. 75% utilization. 100% diversion.	40 Railcars per trip	50 Railcars per trip	900	1,125	Railcars	900	1,125
Traile vessels	One vessel every three days. 500 to 700 trailers average capacity. 75% utilization. 70% to 90% diversion. Two cars per trailer.	500 trailers per vessel 70% diversion	700 trailers per vessel 70% diversion	31,938	57,488	Trailers	15,969	28,744
Highway trailers	Double trailers count passing from Whitehorse to Alaska (5,658). 40% to 60% diversion.	40% diversion	60% diversion	4,526	6,790	Trailers	2,263	3,396
Defence							**136**	**430**
Strykers	1,000 strykers in Alaska. Full deployment once every two to five years. Two strykers per railcar.	Full deployment once every five years.	Full deployment once every two years.	200	500	Strykers	100	250
Other Military	Three bases. One to five railcars per month per base.	One railcar per month per base.	Five railcars per month per base.	36	180	Railcars	36	180

7 Preliminary Traffic Forecast and Next Steps

Exhibit 45. Forecast of available and induced freight flows on the Alaska-Canada Rail Link

	Assumption	Total Available	Volume Induced Low - High		Total Forecasted Quantity Low - High			Total Forecasted Carloads Low - High	
Equipment and Machinery to Initiate Mine Development								**725**	**1,450**
Yukon	100 machines and other equipment for each of 33 potential coal and mineral mines	3,300 Equipment Items	25%	50%	825	1,650	Equipment Items	413	825
Alaska	100 machines and other equipment for each of 25 potential coal and mineral mines	2,500 Equipment Items	25%	50%	625	1,250	Equipment Items	313	625
Mining Materials and Supplies								**25,375**	**50,750**
Yukon and Alaska	1,250 tonnes of supplies[1] per million tonnes produced. 80 tonnes per car	1 Million Tonnes	25%	50%	0	1	Million Tonnes	3,500	7,000
Crest	"	7 Million Tonnes	25%	50%	2	4	Million Tonnes	21,875	43,750
Coal								**1,892,500**	**3,785,000**
Yukon	CRA estimate of resources and reserves. 100 tonnes per car	757 Million Tonnes	25%	50%	189	379	Million Tonnes	1,892,500	3,785,000
Minerals and Semi-Processed Metals								**16,240,000**	**32,480,000**
Yukon	CRA estimate of resources and reserves. 100 tonnes per car	512 Million Tonnes	25%	50%	128	256	Million Tonnes	1,280,000	2,560,000
Alaska	75% CRA estimate of Yukon resources and reserves. 100 tonnes per car	384 Million Tonnes	25%	50%	96	192	Million Tonnes	960,000	1,920,000
Crest	CRA estimate of resources and reserves. 100 tonnes per car	5,600 Million Tonnes	25%	50%	1,400	2,800	Million Tonnes	14,000,000	28,000,000
Pipeline Construction								**2,294**	**4,587**
AAHP								**1,584**	**3,167**
Pipe	2,767 KM pipe 20 - 25 meters of pipe per car	2,767,000 Meters of pipe	25%	50%	691,750	1,383,500	Meters of pipe	1,384	2,767
Materials and Supplies	500 carloads for machinery and equipment 300 carloads for new infrastructure	800 Carloads	25%	50%	200	400	Carloads	200	400
Mackenzie								**710**	**1,420**
Pipe	1,220 KM pipe 20 - 25 meters of pipe per car	1,220,000 Meters of pipe	25%	50%	305,000	610,000	Meters of pipe	610	1,220
Materials and Supplies	250 carloads for machinery and equipment 150 carloads for new infrastructure	400 Carloads	25%	50%	100	200	Carloads	100	200

1 See exhibits 28 and 29 for supplies required for a typical mill and mine.

Exhibit 44. Forecast of existing flows that may divert to Alaska-Canada Rail Link

	Assumption	Range of Expectations		Quantity per Year			Carloads per Year	
		Low - High		Low - High			Low - High	
Diversion of existing highway and coastal maritime intermodal							**24,607**	**41,476**
Alaska Rail-Marine Service	One barge every five days. 400 to 600 TEU capacity. 75% utilization. 100% diversion. Four TEU per car	400 TEU capacity	600 TEU capacity	21,900	32,850	TEU	5,475	8,213
Acuatrain (CN)	30 trips per year. 40 to 50 railcars per trip. 75% utilization. 100% diversion	40 Railcars per trip	50 Railcars per trip	900	1,125	Railcars	900	1,125
Trailer vessels	One vessel every three days. 500 to 700 trailers average capacity. 75% utilization. 70% to 90% diversion. Two cars per trailer.	500 trailers per vessel 70% diversion	700 trailers per vessel 70% diversion	31,938	57,488	Trailers	15,969	28,744
Highway trailers	Double trailers count passing from Whitehorse to Alaska (5,658). 40% to 60% diversion	40% diversion	60% diversion	4,526	6,790	Trailers	2,263	3,395
Defence							**138**	**430**
Strykers	1,000 strykers in Alaska. Full deployment once every two to five years. Two strykers per railcar	Full deployment once every five years.	Full deployment once every two years.	200	500	Strykers	100	250
Other Military	Three bases. One to five railcars per month per base	One railcar per month per base.	Five railcars per month per base.	38	180	Railcars	38	180

Exhibit 45. Forecast of available and induced freight flows on the Alaska-Canada Rail Link

	Assumption	Total Available	Volume Induced Low - High		Total Forecasted Quantity Low - High			Total Forecasted Carloads Low - High	
Equipment and Machinery to Initiate Mine Development								**725**	**1,450**
Yukon	100 machines and other equipment for each of 33 potential coal and mineral mines	3 300 Equipment Items	25%	50%	825	1,650	Equipment Items	413	825
Alaska	100 machines and other equipment for each of 25 potential coal and mineral mines	2 500 Equipment Items	25%	50%	625	1 250	Equipment Items	313	625
Mining Materials and Supplies								**25,375**	**50,750**
Yukon and Alaska	1 250 tonnes of supplies[1] per million tonnes produced 80 tonnes per car	1 Million Tonnes	25%	50%	0	1	Million Tonnes	3 500	7,000
Crest	"	7 Million Tonnes	25%	50%	2	4	Million Tonnes	21 875	43 750
Coal								**1,892,500**	**3,785,000**
Yukon	CRA estimate of resources and reserves 100 tonnes per car	757 Million Tonnes	25%	50%	189	379	Million Tonnes	1 892 500	3 785 000
Minerals and Semi-Processed Metals								**16,240,000**	**32,480,000**
Yukon	CRA estimate of resources and reserves 100 tonnes per car	512 Million Tonnes	25%	50%	128	256	Million Tonnes	1 280 000	2 560 000
Alaska	75% CRA estimate of Yukon resources and reserves 100 tonnes per car	384 Million Tonnes	25%	50%	96	192	Million Tonnes	960 000	1 920 000
Crest	CRA estimate of resources and reserves 100 tonnes per car	5 600 Million Tonnes	25%	50%	1 400	2 800	Million Tonnes	14 000 000	28 000 000
Pipeline Construction								**2 294**	**4 587**
AAHP								**1 584**	**3 167**
Pipe	2 787 KM pipe 20 - 25 meters of pipe per car	2 787 000 Meters of pipe	25%	50%	691 750	1 383 500	Meters of pipe	1 384	2 767
Materials and Supplies	500 carloads for machinery and equipment 300 carloads for new infrastructure	800 Carloads	25%	50%	200	400	Carloads	200	400
Mackenzie								**710**	**1 420**
Pipe	1 220 KM pipe 20 - 25 meters of pipe per car	1 220 000 Meters of pipe	25%	50%	305 000	610 000	Meters of pipe	610	1 220
Materials and Supplies	250 carloads for machinery and equipment 150 carloads for new infrastructure	400 Carloads	25%	50%	100	200	Carloads	100	200

[1] See exhibits 28 and 29 for supplies required for a typical mill and mine.

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Exhibit 46. Summary of freight flows on the Alaska-Canada Rail Link

Freight Flow	Carloads per Year[1]		Trains per Day[2]	
	Low - High		Low - High	
Diversion of existing highway and coastal maritime intermodal	24,607	41,476	1	1
Minerals and Semi-Processed Metals	138,133	276,267	4	9
Coal	37,850	75,700	1	2
Other (Mining Materials and Supplies, Defence, Pipeline Construction, Mine Development)	825	1,808	0	1
Total	**201.415**	**395.251**	**6**	**13**

1 "Carloads per Year " for pipeline construction flows assumes constant demand over five year life; Crest iron ore flows assumes constant demand over 150 year life; coal and other mineral-related freight flows assumes constant demand over 50 year life.

2 "Trains per Day" assumes 100 carload trains operating six days per week.

These preliminary estimates suggest that the Alaska-Canada Rail Link would enjoy a diverse traffic mix made up of a variety of commodities being shipped between a number of different origin-destination pairs. This portfolio of traffic would support an operation of between 6 and 13 mainline trains per day. The projected traffic is largely long-haul, bulk commodity, unit train business and intermodal, the core businesses of every major North American railroad. While further detailed analyses are warranted, it does appear that a sufficient volume of profitable traffic could generate enough profits to justify building the Alaska-Canada Rail Link.

PASSENGER TOURISM DEVELOPMENT OPPORTUNITIES

In addition to the potential benefits we discussed in this paper, the proposed Alaska-Canada Rail Link may stimulate growth in the important economic sector of passenger tourism. Worldwide, tourism is one of the major socio-economic sectors, contributing as much as 10.2 percent of the gross global domestic product (GDP), and it is a leading component of international trade (WTO 2003). In 2002, the number of international tourists topped 700 million. The tourism industry is an important and growing sector for both Alaska and the Yukon. In Alaska, tourism is the fourth largest employer in Alaska, supplying 25,996 jobs in 2002. Residents and non-residents spent a total of $2.9 billion, of which Alaska retained $1.8 billion (Economic Performance Report 2003 pp. 28-29).

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The region is clearly amenable to rail tourism; the White Pass & Yukon operates solely as a tourist railway, and the Alaska Railroad operates profitable daily passenger service during the summer months. These tourist routes, however, are readily accessible to and extensively utilized by cruise ship passengers, an advantage that a rail link through the interior regions of the Yukon and Alaska would not enjoy. Nonetheless, a Yukon rail link might prove attractive to tour operators seeking to offer specialized scenic and wilderness tourism to currently little-travelled areas.

An analysis of the proposed rail link's effect on tourism must first determine where most ecotourists come from, by which mode of travel they arrive, what attracts them to a destination, and what their motivations and expectations are. It must then explore how the proposed rail link might enhance the tourist experience and draw new visitors.

Mobility as a Force for Economic Development

Transport infrastructure is an important factor in regional and national economic development. Direct expenditure on construction and maintenance of transport infrastructure is an important source of employment for many regions. In particular, government spending on infrastructure is often used as an important employment-generating policy tool to provide economic stimulus during recessions.

There has long been a debate as to whether infrastructure precedes development or vice versa. This debate is not very productive for our purposes, since development and transport infrastructure clearly depend on each other and inch along, each supported by the other. As a result, there is a strong association between the stock of transport infrastructure and national level of income; countries with higher GDP per capita tend to have more paved roads. Furthermore, it is noticeable that the share of transport sector in overall infrastructure investment increases with income levels. The World Bank reports that a 1 percent increase in per capita GDP means a 0.8 percent increase in paved roads.

In all, there is evidence that, as a public investment, transport infrastructure yields a high rate of return. For example, the estimated rates of return of investment in transport infrastructure are 77 percent in Taiwan and 51 percent in Korea.[87] Another study has also estimated the returns on transport investment in developing countries to be as high as 95 percent.[88] The high rates of return are not entirely unexpected, considering that many of these projects are in regions where existing networks are limited.

These figures may have been overestimated, due to other variables that affect output growth and infrastructure investment but are not included in the studies. The average economic rates of return on transport projects supported by the World Bank are reported to be lower at about 18 percent (1974–1982) and 21 percent (1983–1992).[89] Even accounting for inaccuracies, however, these figures are still higher than other types of basic infrastructure. In this context, it is important to note that adequate transport infrastructure is necessary but not sufficient to facilitate economic growth. Economic development depends also on other favourable economic conditions and appropriate government policies. Transport infrastructure can contribute significantly to economic development only when it provides services that respond to effective demand.

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[87] Uchimura, K. and H. Gao. The Importance of Infrastructure on Economic Development. Washington, D.C.: World Bank, 1993.

[88] Canning, D. and M. Fay. "The Effect of Transportation Networks on Economic Growth." Columbia University Working Paper, New York, 1993.

[89] Khandker et al. 1994. Khandker, S. R., V. Lavy, and D. Filmer. "Schooling and Cognitive Achievements of Children in Morocco." World Bank Discussion Paper no. 264, Washington, D.C.: World Bank, 1994.

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ISSUES REQUIRING FURTHER RESEARCH

This paper employs a high-level analysis framework for analyzing potential benefits that must be expanded upon to give precision to economic and non-economic impacts of the proposed rail link. CRA recommends the following activities for inclusion in a complete feasibility study.

PROPOSED INFRASTRUCTURE

- Prepare detailed cost estimates of each alternative route for the proposed Alaska-Canada Rail Link and identify any major environmental or other non-economic issues (e.g., First Nations' or community concerns) that each route will also need to address.

MINERALS

- Conduct detailed analyses of each known deposit
  - Predict capital requirements for mineral development
  - Analyze processing costs for most promising mineral deposits
  - Understand the competitive environment of potential mineral developments
- Evaluate areas being explored as potential mineral resources
  - Analyze the use of genetic ore models in the identification of likely deposits

ENERGY AND ENERGY TRANSMISSION

- Develop detailed production forecasts of all current and future energy sources
- Analyze energy sector development scenarios based on expansion proposals such as the Mackenzie Valley pipeline
- Establish development possibilities with and without proposed railway
- Determine grid capacity and transmission requirements for potential energy developments

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DETAILED TRAFFIC FORECAST

- Develop detailed demand forecasting model(s) predicting freight tonnage on the rail line by commodity, origin, destination, and year
    - Include major sensitivities such as price of energy, price of various commodities, strategic alternatives such as if ore will be processed at the mine or at an existing processing facility elsewhere
    - Identify current freight flows between the Alaska/Yukon region and the rest of Canada and the United States and estimate the amount of traffic, by current mode, which might be profitably diverted to rail if the rail link is built.
- Predict when potential mines will open using survey and forecasting methodology
- Estimate new traffic flows that will be generated by induced demand

ECONOMIC BENEFITS OF PROPOSED RAILWAY

- Estimate freight cost savings attributable to use of rail as a substitute for other currently transportation modes
- Construct or modify existing Input - Output models to generate economic multipliers to measure secondary impacts of the proposed railway investment and investments enabled by the presence of the railway within parameters relevant to specific policy analyses
- Quantify the synergies of co-developing a multi-use transport corridor
    - Develop relationship between telecommunications development, economic development, and transportation accessibility.
    - Explore shared corridor synergies in detail.

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CONCLUSION

Preliminary estimates suggest that the Alaska-Canada Rail Link would enjoy a diverse traffic mix made up of a variety of commodities being shipped between a number of different origin-destination pairs. This portfolio of traffic would support an operation of between six and thirteen mainline trains per day. The projected traffic is largely long-haul, bulk commodity, unit train business and intermodal, the core businesses of every major North American railroad. While further detailed analyses are warranted, it does appear that a sufficient volume of profitable traffic could generate enough profits to justify building the Alaska-Canada Rail Link.

It is reasonable for the Government to devote financial support to a detailed feasibility study that will shape this project's definition, detail the business case, and facilitate the efforts of the private sector.

Appendix

APPENDIX A: ANCILLARY MINERAL DEPOSITS IN THE YUKON

CRA has identified 34 deposits that we believe may be developed over the course of the next 30 years. We profiled the seven most promising deposits in chapter 3. Below we provide brief descriptions of 17 of the ancillary deposits that are most significant for this study, grouped by commodity.

Copper-Lead-Zinc-Gold-Silver

Casino Property

The Casino deposit spans 735 mineral claims and has the potential for large bulk tonnage production of copper, gold, and molybdenum for 20 or more years. The deposit contains 178.2 million tonnes of supergene sulphide and hypogene sulphide ore and is located 300 kilometres northwest of Whitehorse. Casino is owned by Great Basin Gold Ltd., but was optioned to Lumina Copper Corporation in 2002.

Clear Lake Property

Clear Lake lies 70 kilometres east of Pelly Crossing and is a 5.6 million-tonne shale-hosted stratiform lead, zinc, and silver massive sulphide deposit that is owned by Energold Mining Ltd. It is currently inactive.

Dublin Gulch Property

The Dublin Gulch property, owned by Strata Gold Corporation, contains 321 mineral claims and 10 mineral leases in sheeted, low sulphide quartz veins containing gold and bismuth. It has reserves of 1.51 million ounces of contained gold stemming from 50.4 million tonnes of ore grading 0.93 grams/tonne.

Fyre Lake Property

Fyre Lake contains copper-cobalt-gold and massive sulphide mineralization and is situated 160 kilometres northwest of Watson Lake. The 15.4 million-tonne deposit is owned by Pacific Ridge Exploration Ltd. (80 percent) and Welcome Opportunities (20 percent), who are currently seeking a joint venture partner.

Ice Property

Ice Property's deposit contains 4,561,863 tonnes of mineral resources grading 1.48 percent copper. Gold, silver, and cobalt are also present, though to a lesser extent. The property is situated 60 kilometres east of the Ross River and is owned by Expatriate Resources Ltd.

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Howard's Pass (XY) Property

Placer Dome North America's deposit, Howard's Pass, is a massive sulphide mineralization body estimated to contain 360 million tonnes of mineral resources grading 7 percent combined lead and zinc. It is located 55 kilometres northwest of CanTung and is currently inactive.

Jason Property

MacPass Resources Ltd. owns the Jason property, which lies 13 kilometres from the MacMillan Pass and is currently inactive. The deposits comprise lead, zinc, silver, barium, and iron precipitated from exhaled hydrothermal brines within 14.1 million tonnes of sulphide ore.

Kudz Ze Kayah Property

The 11.3 million-tonne Kudz Ze Kayah property is home to the ABM mineral deposit, a tabular mineralized body containing copper, lead, zinc, silver, and gold. Located 110 air kilometres southeast of Ross River, the property is owned by Kudz Ze Kayah – Teck Cominco Ltd.

Logan Property

The owners of the Logan property, Expatriate Resources, Ltd. (60 percent) and Almaden Minerals Ltd. (40 percent), plan to combine this site with the nearby Wolverine property. Logan produces zinc and silver, which occur in a tabular, fault-bounded body and is located 110 kilometres northwest of Watson Lake.

Marg Property

The Marg deposit is home to four stacked massive sulphide lenses hosted by Devono-Mississippian felsic matavolcanic rocks, and contains 5.5 million tonnes of mineralized material at an average grade of 1.76 percent copper, 2.46 percent lead, 4.6 percent zinc, 0.29 ounces of gold/tonne, and 1.8 ounces of silver/tonne. The property is owned by Atna Resources (66.7 percent) and Comeco (33.3 percent) and is located 42 kilometres northeast of Keno City. Exploration is ongoing.

Tom Property

Hudson Bay Exploration and Development's Tom property is made up primarily of galena, spahlerite, and barite that is concentrated within three zones. The deposit contains 9,283,700 tonnes of mineral reserves grading 7.5 percent lead, 6.2 percent zinc, and 69.4 grams of silver/tonne. This inactive deposit is situated 13 kilometres southeast of Macmillan Pass.

Wellgreen Property

Northern Platinum Ltd.'s Wellgreen property is located 125 kilometres northwest of Haines Junction and is the site of ongoing exploration. The deposit contains 50 million tonnes of sulphide mineral reserves grading 0.35 percent copper, 0.36 percent nickel, 0.54 grams platinum/tonne, and 0.34 grams palladium/tonne.

Coal

The Yukon has an estimated 800 million tonnes of coal occurring in contained areas, including Bonnet Plume Basin (660 million tonnes), Rock River (60 million tonnes), Whitehorse (26 million tonnes), and Division Mountain (45 million tonnes).

Bonnet Plume Basin

The largest and highest quality coal resources in the Yukon are confined in five deposits of the Bonne Plume Basin. The only significant problem with the deposits is the lack of transport and infrastructure in its location in north-central Yukon.

Division Mountain Property

Cash Minerals Ltd.'s Division Mountain coal deposit, located 90 kilometres north-northwest of Whitehorse, is estimated to contain 52.9 million tonnes of near surface high volatile bituminous coal occurring in at least 14 major seams. The company is currently undertaking extensive exploration and project scoping studies at this deposit.

Whitehorse Property

The Whitehorse property, located 25 kilometres southwest of Whitehorse, is owned by Whitehorse Coal Corporation and contains 458,000 tonnes of coal. The coal is ranked as meta-anthracite with 3.5 percent moisture, 38.2 percent ash, and a calorific content of 19,765 KJ/kilogram. The deposit is currently inactive.

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Tungsten

Mactung Property

The Mactung property is located 250 kilometres northeast of the Ross River and comprises 13,669,000 tonnes of mineralized material grading 0.95 oxides. The primary commodity to come from this deposit is tungsten, though it remains an undeveloped resource. The property is owned by North American Tungsten Corporation Limited.

Molybdenum

Red Mountain Property

The Red Mountain porphyry molybdenum deposit is owned by Tintina Mines Limited and is located 80 kilometres northeast of Whitehorse. Underground exploration is planned for the estimated 187.3 million tonnes of mineralized material grading 0.167 percent MoS_2 and 21.3 million tonnes grading 0.29 percent MoS_2.

APPENDIX B: ABOUT CHARLES RIVER ASSOCIATES

Since its founding in 1965, Charles River Associates has provided clients with expert consulting services that address complex business and regulatory problems. CRA's reputation for accurate, technically sophisticated, and rigorously objective analysis spans many different disciplines and industry areas.

The depth of CRA's expert knowledge ensures that every CRA project is informed by sound economic theory and industry best practices. The breadth of CRA's expertise brings clients an integrated and comprehensive approach to complex and multi-faceted issues such as those addressed in this study. One of the cornerstones of CRA's success is its ability to translate complex problems and solutions into language easily understood by those from other disciplines. This blend of sophistication, institutional knowledge, and client problem orientation is reflected in the qualifications presented in this Expression of Interest.

Throughout its history, CRA has been a leader and innovator in the application of economic tools and concepts to the solution of complex transportation problems, winning international recognition for its work in the transportation sector. CRA applies groundbreaking approaches to solve problems in demand forecasting, investment planning, project financing and analysis, service design, competition policy, dispute resolution, and business and regulatory strategy. Founded by transportation economists, CRA has shaped national, regional, and international debates over transportation policy. CRA's work has involved all transport modes, and its clients have included regulators, public agencies, shippers, equipment manufacturers, operators, and law firms involved in transportation-related disputes.

CRA has significant experience in railroad systems planning, demand estimation, and market research, as well as a long history of providing support to railroads and evaluating their competitive and regulatory environments. The firm's work has ranged from strategic planning to policy analysis to assessments of specific market situations. In addition, CRA has advised clients on capital investments, asset valuation, and budgeting issues. Exhibit 1 provides a brief company profile.

APPENDIX C: ABOUT THE AUTHORS

Larry Shughart, a CRA Principal, served as *Project Manager* for this assignment. Mr. Shughart specializes in performance management, financial management, and network operations engineering, and consults mainly to the railroad and trucking industries. During his tenure at CRA, Mr. Shughart has co-authored expert testimony in support of a national railroad labour arbitration hearing, managed a litigation project involving a leading rail car manufacturer and a Class I railroad, and served as the lead advisor to the Province of British Columbia on matters relating to the restructuring and privatisation of BC Rail. For the trucking industry, Mr. Shughart assisted in developing a deployment plan to expedite the implementation of a new technology safety device. Mr. Shughart regularly draws on his operations knowledge and service design experience when offering expert advice and recommendations related to Amtrak passenger train scheduling and operations in support of the U.S. Department of Transportation Office of Inspector General.

Prior to joining CRA, Mr. Shughart utilized this expertise for 14 years at CSX Corporation, in Jacksonville, Florida, where he worked in a variety of areas, including intermodal, performance improvement, locomotive operations, strategic planning, service design, finance, operations research, and engineering. While at CSX Intermodal, he employed the AAR Service Planning Model to evaluate proposed operating scenarios that resulted in the wholesale redesign of the CSX Intermodal network. In addition, Mr. Shughart applied game theory techniques to evaluate marketing strategies for the intermodal business.

Prior to CSX, Mr. Shughart worked in the short line industry. His academic experience includes membership on the engineering department advisory board at the University of Florida and research support for the Massachusetts Institute of Technology (MIT) Center for Transportation Studies. Mr. Shughart also served as a professor of economics at the University of North Florida. *(M.S. Transportation, Massachusetts Institute of Technology)*

Harry Foster, a CRA Principal, is an expert in competition and regulatory economics, environmental economics, and other public policy issues. Dr. Foster has worked in these areas for a wide range of CRA clients, including numerous public- and private-sector clients with interests in the transportation sector. Notably, Dr. Foster was project manager for CRA's engagement by CN to analyze the consequences on competition of its potential acquisition of the eastern railroad assets of CPR. Recently, he led CRA's analysis of public policy issues on matters related to the sale of BC Rail. Prior to joining CRA, Dr. Foster was a senior economist at General Motors Corporation, consulting on environmental, energy, transportation policy, tax policy, and antitrust issues. *(Ph.D. Economics, Massachusetts Institute of Technology)*

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George Rainville, an Associate Principal and Senior Geologist at CRA, heads CRA's efforts in resource evaluation and minerals technologies. He has participated in a range of CRA research projects dealing with mineral sources, availability, and costs. He has contributed to major commodity studies, technical and economic evaluations of mineral projects, studies of environmental issues relating to mining and metals recovery, market research for selected minerals, sourcing strategies for minerals, antitrust support work, diversification analyses, and technical and economic planning assistance. Prior to joining CRA, Dr. Rainville was head of applied minerals technology at Kennecott Corporation. He has also been a lecturer at Boston University, teaching courses such as Historical Geology, Physical Geology, and Resources. *(Ph.D. Economic Geology, Boston University)*

Charlie Neill, a CRA Senior Consultant, has more than 30 years of experience consulting to the energy industry, providing counsel on U.S. and international natural gas and electric issues for producers, pipelines, LDCs, large energy consumers, and governments. He has performed feasibility studies for LNG export projects in Norway, Trinidad, and Nigeria. He conducted the market research for the development of the Lake Charles LNG import facility. He has analyzed the natural gas markets extensively, including the viability of regions to support major natural gas export projects from Canada, the peak loads needs of LDCs, the prospects for additional LNG imports, the adequacy of the regional pipeline infrastructure, and the impact on gas markets of the introduction of gas fired combined cycle power plants. He has also assisted LDC's in developing operational purchasing strategies, including logistical support software for implementation. Prior to joining CRA, Mr. Neill was the president of Swapco, Inc., founded Logistic Solutions, and was Vice President and Managing Partner at Jensen Associates, Inc. Mr. Neill has appeared in proceedings at the Federal Trade Commission, provided expert testimony before the U.S. Congress, the Federal Energy Regulatory Commission, the Massachusetts Department of Telecommunications and Energy, and in arbitration proceedings. *(M.A. Economics, Duke University)*

James Hasik is a CRA consultant in defence and logistics management. In his recent defence work with some of the industry's largest firms, Mr. Hasik has analyzed strategic questions such as the economic structure of the space satellite industry, market opportunities in munitions logistics, and the impact of evolving customer demand on the military communications business, the probably results of U.S. base realignments after 2005, and evolving requirements for light armoured vehicles. Before entering private practice, Mr. Hasik was a consultant with the supply chain management practices of IBM Global Services and Accenture, where he redesigned distribution systems, cut purchasing costs, evaluated transportation and inventory networks, and designed training curricula for supply chain management professionals. Early in his career, he was an officer of the U.S. Navy. *(M.B.A. Finance and Applied Economics, University of Chicago)*

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B. Venkateshwara, a CRA Principal, has more than 15 years of consulting experience in the electric and gas industries and has served public sector and industry clients. He has focused on the electricity industry, where he has assisted electric utilities and merchant generating companies with business strategy issues, merger and acquisition analysis, resource planning, power solicitations, and fuel and power supply contract negotiations. He has led analytic assignments on a wide range of issues in U.S. wholesale electric markets and independent power transactions; developed negotiating strategy for clients in connection with specific transactions; and testified as an expert on electric market issues. Prior to joining CRA, Dr. Venkateshwara served as an electric and gas industry expert at McKinsey & Company. Before that, he was Vice President at ICF Resources where he led a practice focused on independent power and wholesale electric markets. *(Ph.D. Energy & Policy, University of Pennsylvania)*

Robert Finley, a CRA consultant, is an expert in the management and operation of railroads with close to three decades of executive experience in the industry. His particular areas of specialty are finance, marketing, workouts, acquisitions, and leasing. As Executive Vice President of Iowa Interstate Railroad Limited, a $30 million regional railroad operating from Chicago to Omaha, he directed finance and human resources. As Vice President of Chicago West Pullman Transportation Corporation, a growth-through-acquisition company, Mr. Finley managed all aspects of new property purchases while assisting in selected marketing efforts.

Currently, Mr. Finley assists the Housatonic Railroad, a short-line railroad located in western Massachusetts and Connecticut, as Vice President of Finance. In this part time job he oversees the finance and many administrative functions of the property. He also works with Iowa Pacific Holdings, LLC, an operator of railroads and freight car repair facilities, for which he coordinates all financial and accounting functions. Mr. Finley has also held positions with the Southern Railway System, United States Railway Association, and Southern Pacific. While at Southern Pacific, his group won the Golden Freight Car for the most innovative marketing effort of 1986. *(M.B.A., Finance, The Wharton School of the University of Pennsylvania)*

Brian Caouette is an Associate at CRA. Mr. Caouette has worked on a number of projects in the transportation, energy, and trade sectors in the United States, Canada, and Mexico. Mr. Caouette's analytical background includes financial modelling, statistical programming, and GIS rail network analysis. Prior to joining CRA, Mr. Caouette served as a market research analyst and as a Peace Corps volunteer in rural Panama. *(B.A. Northwestern University)*